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Notes on the Shore Vegetation of the Danish West Indian Islands.

A Supplement to my earlier paper on the Halophyte vegetation of
the Islands.

By

F. Børgesen.

(With Plate III—VI.)

During the winter 1905—06 I visited the Danish West Indian Islands for the third time, for the purpose of investigating the algal flora, but on my many excursions I naturally had ample opportunities of observing the land-flora, and having on these excursions seen some things, that may perhaps be of interest and in a different way may supplement my earlier description of the vegetation along the shores, I have collected my observations in this paper, which has to be regarded as supplemental to the description of the halophytic vegetation given by me in a paper: "Om Vegetationen paa de dansk-vestindiske Øer", Kjøbenhavn 1898¹⁾.

I may be permitted here to render my thanks to the Direction of the Carlsberg Fund, for the grant towards the reproduction of the many pictures and the English translation.

Finally I offer my best thanks to Docent Raunkiær for having determined my collections of the flowering plants.

In my earlier paper I have divided the halophytic vegetation into the following 5 sections: the seagrass vegetation, the sand strand vegetation, the rocky coast vegetation, the mangrove vegetation and the marsh land vegetation near lagoons and salt ponds.

¹⁾ As to the literature mentioned here and afterwards see List of Literature.

In consequence of my latest observations I think the coastal halophytic vegetation may be most naturally divided in the following way:

- A. The hydrophyte vegetation.
 - I. The muddy and sandy soil vegetation¹⁾.
 - 1. The seagrass (and algæ) formation.
- B. The halophyte vegetation.
 - I. The muddy soil vegetation.
 - 1. The mangrove formation.
 - 2. The *Salicornia* formation.
 - 3. The *Conocarpus* formation.
 - II. The sand strand vegetation.
 - 1. The *Pes capræ* formation.
 - 2. The *Tournefortia* formation.
 - 3. The *Coccoloba*-Manchineel formation.
 - III. The rocky coast vegetation.

With regard to the associations included under the formations, I may refer to the more special sections.

Regarding the section III, the rocky coast vegetation, one can naturally also separate it into several formations e. g. a lichen (and algæ) formation, a Chasmophyte formation etc. I have not made sufficient observations however, to permit such divisions.

Before proceeding to the description of the formations I wish to give some few remarks on the external conditions affecting the halophilous vegetation.

As to the soil the shores of the Danish West Indian islands differ very much. In some places we have sandy or rocky shores, open to the whole power of the sea, in others, the coast is sheltered by off-lying coral-reefs, allowing the deposit of mud and clay; and such altered conditions often differ at a very short distance, and thus lead to a very different development of the vegetation, in connection with the other, more or less, altered conditions of life.

To understand the following it must be emphasized, that the tide is scarcely perceptible, or in any case, of very slight significance in the Danish West Indies and the else, somewhat arranging and dividing influence of the tide on the vegetation is thus absent here, and produces the effect that the boundaries, between

¹⁾ The lithophyte vegetation I do not deal with here.

the formations at the level of the sea, are more effaced, and each particular formation therefore sometimes more difficult to keep apart.

A factor, which highly marks the West Indian coast vegetation, is the wind, where no special conditions prevent it from affecting the vegetation. In my earlier paper I have emphasized how trees and bushes in the *Coccoloba*-Manchineel formation, on account of the strong trade-wind blowing always from the same direction, are cut off quite slopingly and the branches dead on the wind-blown side. In the West Indies the wind is blowing essentially from the East, especially North-East, but often too in a little more southern direction, with the result that its influence on the shape of the trees is particularly distinct, as the stem and the crown, when much exposed, are bent away from the wind: on the north side of the islands in a south western direction, and on the southern side of the islands distinctly, though more slightly, in western direction. In particularly exposed localities, not only bushes but even a tree so hardened against the wind as the manchineel (*Hippomane mancinella* L.) can be laid prostrate on the ground. I will discuss this point later on.

In my earlier paper I have already mentioned the burning heat and the glaring light of the coasts, and I have emphasized that the vegetation in the fresh trade-wind, and in connection with these factors, is liable to a very strong transpiration and is therefore in various ways protected against it.

A. The Hydrophyte Vegetation.

I. The muddy and sandy soil vegetation.

1. The Seagrass (and Algæ) formation.

(Cfr. Børgesen, 1898, p. 3; 1900, p. 2.)

About this formation I have not much to add, beyond what I have already mentioned in my earlier paper. It consists of the following 5 sea-phanerogams: *Cymodocea manatorum* Aschers., *Halodule Wrightii* Aschers., *Thalassia testudinum* Sol., *Halophila Baillonis* Aschers. and *Halophila Aschersonii* Ostenf.

What in my earlier paper was called *Halophila Engelmanni* Aschers., has, after Ostenfeld's examination, turned out to be

a new species, which he has called *Halophila Aschersonii*¹⁾ yet closely related to *H. Engelmanni*, which is known from Florida.

A good many algæ are growing in connection with these Phanerogams, partly creeping species belonging to the genus *Caulerpa*, in their mode of growth imitating the sea-phanerogams, partly species belonging to the genera *Penicillus*, *Udotea* and *Halimeda*, which by means of numerous fine rhizoids growing out from the base of the stem-like part of the thallus, are fastened into the mud and the sand. Both these peculiar forms of algæ

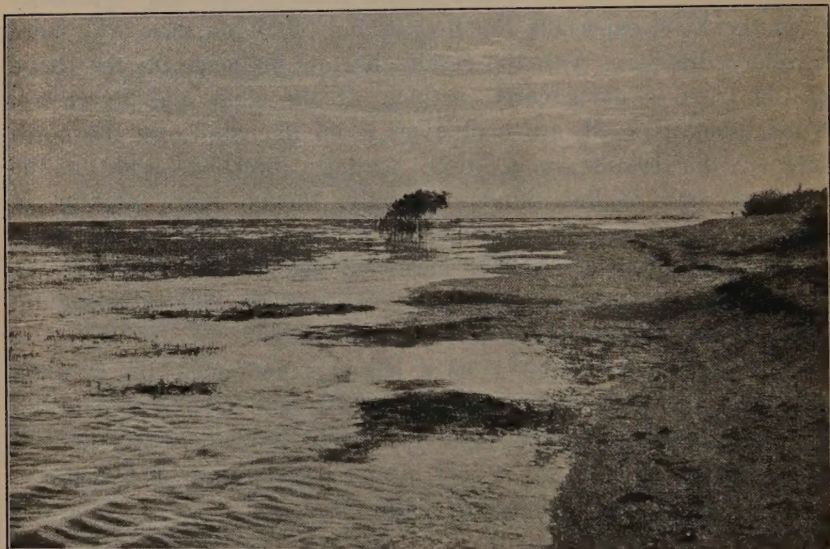


Fig. 1. Seagrass formation on the shore at Fair plane on the south coast of St. Croix. (F. B. phot.)

are, as I have pointed out in earlier papers, characteristic of the warmer seas²⁾.

On the south coast of St. Croix just west of Krausse's lagoon, outside the coast of Fair plane, I have noticed a singularly beautiful

¹⁾ Cfr. Ostenfeld, C. H., *Halophila Aschersonii*, n. sp. (Botanisk Tidsskrift, Bind 24, København 1902).

²⁾ Børgesen, F., A contribution to the knowledge of the marine Algæ vegetation on the coasts of the Danish West-Indian Islands (Botanisk Tidsskrift, Bind 23, 1900, p. 49).

— —, An ecological and systematic account of the Caulerpas of the Danish West Indies (Kgl. danske Vidensk. Selsk. Skrifter, 7. Række, naturv. og mathem. Afd. IV. 5, København 1907).

seagrass formation. I visited the locality several times during my last stay on the islands, and on one occasion the water was so low that a part of the formation was laid dry, as shown in fig. 1.

The picture is looking towards the west, so that Krausse's lagoon is behind the observer. The bottom consists of soft mud mixed with sand, and is covered with a dense vegetation. As far as I could see, and judging from the specimens which a negro waded out and fetched for me, the vegetation essentially consisted of *Thalassia testudinum* Sol., further some *Cymodocea manatorum* Aschers. and *Halodule Wrightii* Aschers. were found. Great quantities of algæ were growing among these Phanerogams. As the most common must be mentioned *Udotea flabellata* Lamour., and especially several *Halimeda*-species such as forms of *Halimeda incrassata* Lamour. and *H. Tuna* Lamour., which at several places covered the bottom quite densely, and lastly great numbers of *Penicillus capitatus* Lam. And between these and the sea-phanerogams numerous Caulerpas were found creeping, especially forms of the species *Caulerpa sertularioides* (Gmel.) Howe, *C. cupressoides* (Vahl) Ag., *C. crassifolia* (Ag.) J. Ag. var. *mexicana*, and *C. prolifera* (Forsk.) Lamour. Here and there some young, newly rooted, *Rhizophora*-seedlings appeared above the mud; and in the middle of the picture is seen a larger *Rhizophora*-plant, showing that the mangrove vegetation of Krausse's lagoon spreading further west will be likely to take possession of this ground soon.

Halophila-species I did not see here, probably because the locality is a little too exposed, as the sea can at some times be rather turbulent with southern and western winds. *Halophila*, on the contrary, are commonly found in bays and lagoons with fresh salt water, e. g. in Christianssted's lagoon on the north side of St. Croix. Here they often grow in shallow water extensively covering the soft and muddy bottom with their delicate pale-green leaves. The thin thread-fine rhizome creeps on the bottom, though often covered by a thin layer of sand or mud.

In Christianssted's lagoon *Cymodocea manatorum* Aschers. also grows in great numbers. Its rhizome is altogether buried in the mud, so that it is often only the uppermost part of the cylindric leaves which appears above the mud. *Thalassia testudinum* Sol. is likewise found here although more rarely. Between the sea-grasses several species of Caulerpas are commonly found, especially *C. cupressoides* (Vahl) Ag., *C. crassifolia* (Ag.) J. Ag. f. *mexicana*,

C. racemosa (Forsk.) W. v. B. var. *lætevirens*, *C. sertularioides* (Gmel.) and others. Of the fixed mud algæ, *Penicillus capitatus* Lam. appears in great numbers, and often grows so densely that it covers the bottom altogether with its spherical heads, forming pure *Penicillus*-associations. Here and there, but far less numerous, species of *Halimeda*, e. g. *H. incrassata* Lamour. and *H. Tuna* Lamour., are found growing in the same way. *Halimeda Opuntia* Lamour. is often found lying on the bottom in large tufts and between its entangled ramifications organic remains and mud gradually accumulate to such an extent that the *Halimeda* sometimes forms mound-like banks rising above the bottom; these are constantly growing at the margin as the *Halimeda* grows new shoots especially at the periphery. It may also be mentioned here that the calcified algæ, and especially perhaps the *Halimeda*-species, contribute greatly, not only to the sand of the strand, which sometimes consists almost entirely of fragments of *Halimeda*-joints, but also to form deposits, both in lagoons as in the sea, in deeper but sheltered localities where the bottom sometimes consists almost entirely of *Halimeda*-gravel. This is the case for instance in the Whites Bay near the south-west end of St. Croix, where at a depth of 5 fathoms my dredge was over and over again filled to the brim with *Halimeda*-joints.

The seagrass formation grows down to a depth of 5—6 fathoms probably deeper. On the west coast of St. Croix outside Frederiksted I have thus seen it at this depth and I noticed here *Thalassia testudinum* Sol., *Halodule Wrightii* Aschers., *Cymodocea manatorum* Aschers. and *Halophila Baillonis* Aschers., which by growing at this depth were protected against the beating of the waves in this open exposed locality. Of algæ were found here as usual a number of creeping Caulerpas and of attached *Penicillus pyriforme* Gepp and several *Halimeda*-species.

The Algæ formation on soft or sandy bottom extends to a far greater depth, at least to 20—30 fathoms, consisting of *Caulerpa*-species and of species belonging to the genera *Penicillus*, *Udotea* and *Halimeda*.

B. The Halophyte Vegetation.

I. The muddy soil vegetation.

1. The Mangrove formation.

(Cfr. Børgesen, 1898, p. 27; 1900, p. 25.)

In the Danish West Indies this consists of the three species, *Rhizophora mangle* L., *Avicennia nitida* Jacq.¹⁾ and *Laguncularia racemosa* G. each species of which forms belt-like associations, in such a way that the *Rhizophora*-association grows outermost, at the lowest level, the *Avicennia*-association in the centre on somewhat higher ground, and the *Laguncularia*-association innermost on the highest and driest ground.

As already mentioned in my earlier paper, the mangrove formation is commonly present on the coasts of the islands where it is sheltered. It further often, but far from always, fringes the salt-ponds, lakes with shallow more or less brackish and often stinking water, which rarely or never is renewed, as the sea only exceptionally is capable of washing over the low sand-dunes which shut off the ponds from the sea.

The soil, on which the mangrove vegetation is growing, is commonly fine, soft mud and clay, sometimes mixed more or less with sand, but mangroves growing on gravel are also to be found; just as *Rhizophora* is to be found growing on rocky coast, where it attaches itself to the rock in cracks and crevices, as Johs. Schmidt (1903, p. 4) mentions may also be the case in Siam.

In the Danish West Indies the mangrove grows either in the sea itself in shallow water at not more than 1—1½ metres, or in the immediate proximity of the level of the sea where the bottom is often covered by only a few inches of water; but long stretches of mangroves can also be seen growing so high that for long periods they are laid dry and in any case only occasionally washed over, when the sea is very high,

Schmidt has (l. c. p. 4—5) given the following definition of the mangrove in Siam. "The mangrove is the formation of tree-like evergreen plants which live on the sea-coasts, and at the mouths of the rivers, and which normally are only found where the soil is either constantly washed over, or at all events regularly

¹⁾ Eggers (1879 p. 84) also locates *Avicennia tomentosa* Jacq. to St. Croix.

at times washed over with salt or brackish water". If this definition had to be applied to the Danish West Indies, not only *Laguncularia*- and *Avicennia*-growths, but even those of *Rhizophora* have often to be excluded from the mangrove formation, as all 3 species as explained above, are found rather often where the bottom is quite laid dry. As the tide is of no practical significance in the Danish West Indies, the ground of the mangrove formation, what the English call "tidal forests", is considerably diminished. More often the three above mentioned species are growing in shallow water, and then *Rhizophora* outermost in deepest water to which it is particularly well adapted through its root-system, inside it *Avicennia*, of which the pneumatophores are comparatively long, often more than $\frac{1}{2}$ metre, then *Laguncularia* with shorter pneumatophores growing innermost on the almost, or quite, dry soil. This is the rule, to which of course there are many exceptions. As the ground is rising gradually below the mangrove formation, partly from deposits from the sea, partly from material brought from land and sometimes assuredly also by upheaval of the earth-crust, and is at last laid dry, it is therefore far from always the case that the *Rhizophoras* are excluded to give place to *Avicennia* and *Laguncularia*. The most luxuriantly developed *Rhizophora*-forest which, as far as I have seen, is to be found at present in the islands, namely the one growing at the head of "Great Cruzbay" on St. Jan, and of which the accompanying plate III shows a little part, is thus growing on quite dry firm soil, only quite near the sea was still found a little lagoon filled with water, which as well as the whole *Rhizophora* ground was shut off from the sea by a rather high sand-bank. Possibly the waves with very high sea can wash over this sand-bank, but certainly a long time can pass without this being the case.

We may therefore in the Danish West Indies define the mangrove as a formation of tree-like evergreen plants growing on the sheltered shores, partly in shallow, salt or brackish water, partly on low-lying soil which is comparatively rarely, sometimes perhaps never covered by salt or brackish water.

That the mangrove formation may be found on quite dry soil makes it more difficult to distinguish between the mangrove vegetation and the transitional vegetation, which Schimper in Asia has called the *Nipa*-formation, and to which, with respect

to Brazil, he refers the two species also occurring in the West Indies: *Conocarpus erecta* L. and *Anona palustris* L. I have in my earlier paper, though with some doubt, included the two last-mentioned species in mentioning the mangrove formation, as they commonly occur among the Laguncularias inside the mangrove vegetation. According to my last observations I consider it more natural to keep them apart from the true mangrove formation, and to refer them, along with some other species, to a special formation, to which I shall return later on.

While the conditions of the level are of great consideration



Fig. 2. Saltriver Bay on the north side of St. Croix. (F. B. phot.).

for the placing of the species belonging to the mangrove vegetation, I cannot, in any case with respect to the Danish West Indies, agree with Schmidt (l. c. p. 8) when he writes that it is not especially the consistency of the soil, but the conditions of the level, which mark the boundary between the mangrove and the sandy shore vegetation. In the West Indies it is firstly, more or less, the exposure of the locality which is the deciding factor as we never find any of the representatives of the mangrove on the exposed, but only on the sheltered coasts. And as on the exposed coasts, the rocky shores excluded, we have only the white coral-sand beach where the sand vegetation grows, and only muddy soil on sheltered coasts, the consistency of the soil will in any case

have marked significance. I may further point out that in the localities of the Danish West Indies where the sand vegetation and the mangrove vegetation are growing together, the sand vegetation is growing outermost towards the sea, and then sheltered by it the mangrove or *Conocarpus* formation.

As mentioned before, the habitat proper of the mangrove is

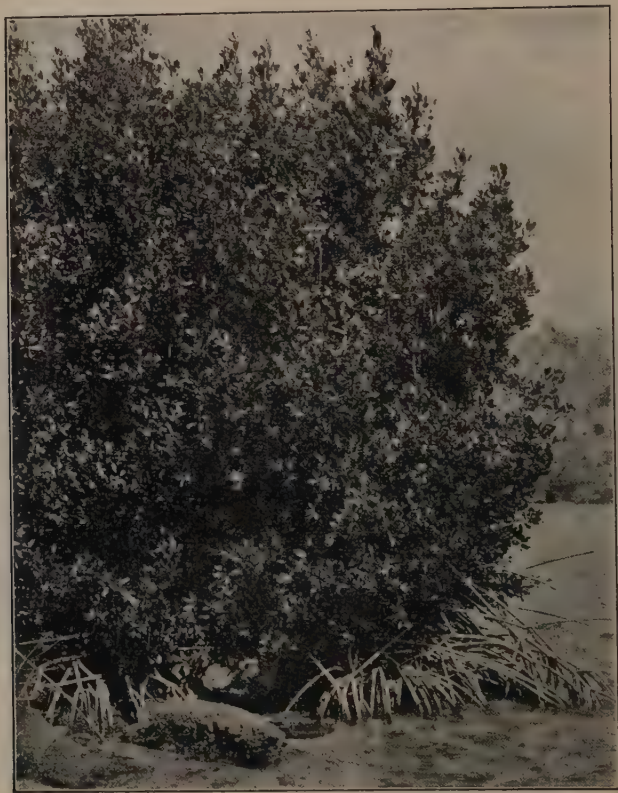


Fig. 3. Young *Rhizophora*-bushes growing on rocky coast in the bay behind Christiansfort in Cruzbay at St. Jan. (F. B. phot.)

the muddy shores, especially at the head of fiords and bays which are protected by off-lying coral-reefs against the open sea (see fig. 2) but as pointed out the mangrove plants are also found growing, not only on sandy soil but also on the bare rock. Strictly speaking I suppose the development to be, that the mangrove vegetation begins on rocky or sandy substratum and gradually as it increases in growth and produces stagnant water between its

numerous roots the mud is deposited. Young mangrove plants are often seen growing in the West Indies on coral reefs where the water is quite clear and fresh. This I have seen at its best at the entrance to Road Harbour on Tortola. And in the Saltriver Bay on the north side of St. Croix *Rhizophora* was found growing on the bare rock without any mud whatever.

Fig. 3 shows a young *Rhizophora*-tree growing on rocky substratum in the little bay behind Christiansfort on St. Jan; below



Fig. 4. *Rhizophora*-vegetation in the Saltriver Bay on the north side of St. Croix.
(F. B. phot.)

on the left the rock is seen. But as the edge of the mangroves gradually grows in breadth more mud is deposited among the roots.

Fig. 4 shows such a somewhat more advanced stage in the Saltriver Bay, on St. Croix. The rocky coast itself is not shown in the picture, but it is at a short distance from the left side of the picture. The *Rhizophora*-vegetation as yet consisted only of a single or some few rows of trees, but these extend more and more into the water, while, as is shown in the picture, vigorous roots which descend vertically, or almost vertically, are growing

down from the overhanging branches, at the same time as the root-system of bow-shaped roots, which issue from the base of the main stem, is constantly increasing in breadth by the formation of new root bows.

The development of this increase of land, which is taking place everywhere where the mangroves occur, is proceeding, as is shown above, from the shores, as the mangrove vegetation first extends along these, slowly working itself outwards. Often the



Fig. 5. The small salt pond on Sandy Point. St. Croix. (F. B. phot.)

ncrease of land takes place most vigorously at the mouth of the fiords, as most material has been supplied by the sea, such as sea-weeds and sand, and in consequence of that a tongue is formed from both sides, which gradually shuts off the bay behind from the sea. In this way we get a lagoon, a water-area more or less shut off from the sea, with which it is only connected by a comparatively narrow opening with shallow water.¹⁾ As more material is gradually deposited this is closed and a lake with brackish

¹⁾ A. S. Ørsted has earlier mentioned this development of the mangrove vegetation (l. c. p. 565) and also Eggers 1878 (p. 11—14).

water is formed. By means of this activity the mangrove vegetation is gradually preparing its own destruction. The water in these lakes shut off from the sea becomes namely more and more foul and stinking and these localities become at last uninhabitable for

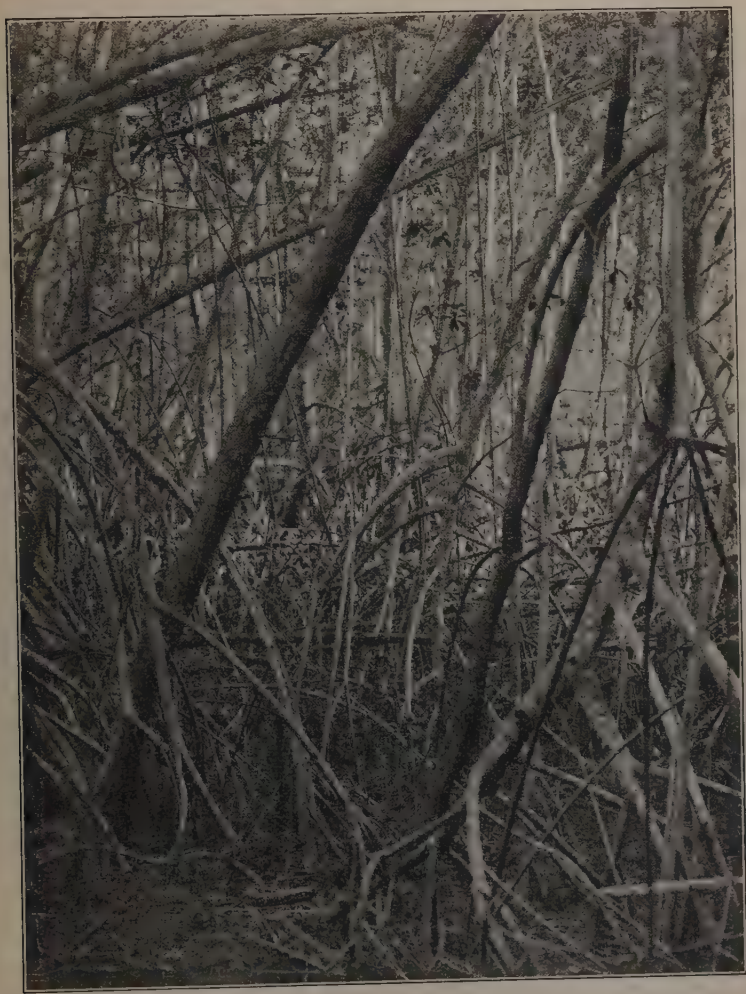


Fig. 6. Interior of the *Rhizophora*-forest of Great Cruzbay, St. Jan. (F. B. phot.)

even the mangrove vegetation. First of all *Rhizophora* disappears; only in one single salt pond left by the sea have I found some few *Rhizophoras* growing, namely in the small salt pond on Sandy Point (see fig. 5); but the dominant species round the salt pond

were *Avicennia* and *Laguncularia*, but even these species seem gradually to be obliged to retire from these localities, often quite devoid of any vegetation whatever, or only inhabited by some smaller marsh shrubs.

However, it is not always that the development takes this course; often the heaping up of the deposits takes place more evenly over the whole region, and when the ground is simultaneously

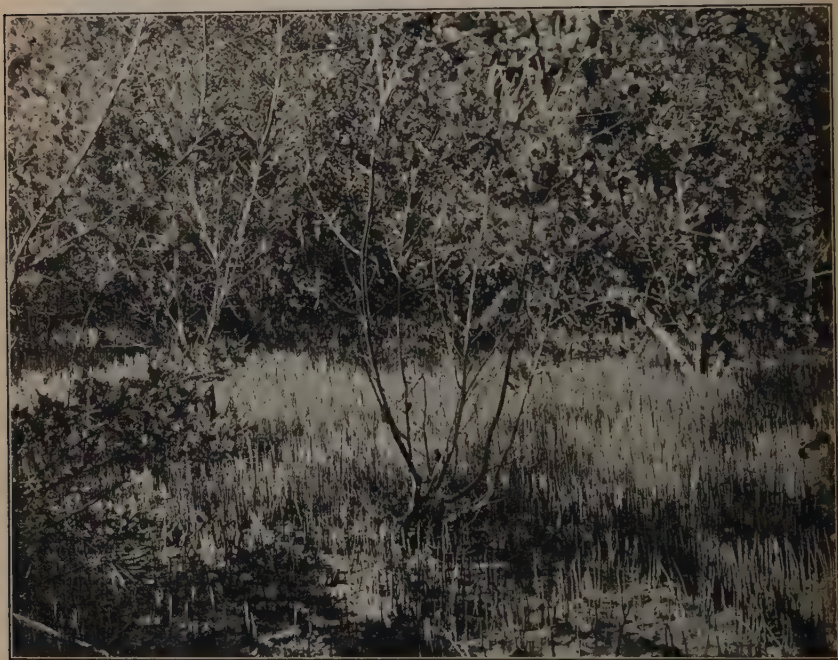


Fig. 7. *Avicennia*-association at the head of Christianssted's Lagoon, St. Croix. Numerous pneumatophores are seen rising from the mud. (F. B. phot.)

rising, the result will be a low-lying flat dry land; and on this land the mangrove vegetation seems to thrive better. As already mentioned very vigorous *Rhizophora*-forests are to be found on a quite dry soil, e.g. the above mentioned one in Great Cruzbay on St. Jan, of which the accompanying picture (Fig. 6) gives a view of the interior. But no doubt it is *Avicennia* and especially *Laguncularia* which are most adapted to these habitats.

At the head of Christianssted's lagoon, where almost dry stretches are found, a luxuriant *Avicennia*-forest (fig. 7) is present

where the ground is widely covered with the well-known asparagus-like grey pneumatophores.

Here on an old *Avicennia*-tree (fig. 8) numerous aerial roots were descending from the main stem and from the under-side of the branches. These roots were much branched, foot long, in their



Fig. 8. An old *Avicennia*-tree with aerial roots, from Christianssteds Lagoon.
(F. B. phot.)

ramifications very similar to those of *Rhizophora*. As in the case of *Rhizophora*, the main root ceases to grow and new side branches arise a little above its point; they only seem to grow very slowly, and scarcely ever reach the ground.

On St. Jan in the mangrove vegetation of Great Cruzbay, I have seen another *Avicennia*-tree (fig. 9) with quite similar aerial roots (fig. 10). Professor V. A. Poulsen has examined the anatomical

structure of these roots, and found that they very much resembled the vertically growing pneumatophores of which I have mentioned the anatomy in my earlier paper (l. c. p. 37).

As is well known, the pneumatophores of *Avicennia* and *Laguncularia* have horizontal roots, creeping close below the surface of the mud. On the gravelly clayish shores of the Hurricane Island, in the harbour of St. Thomas, I succeeded in digging up some young *Avicennia* of which fig. 11 represents a plant in $\frac{1}{8}$ nat. size.

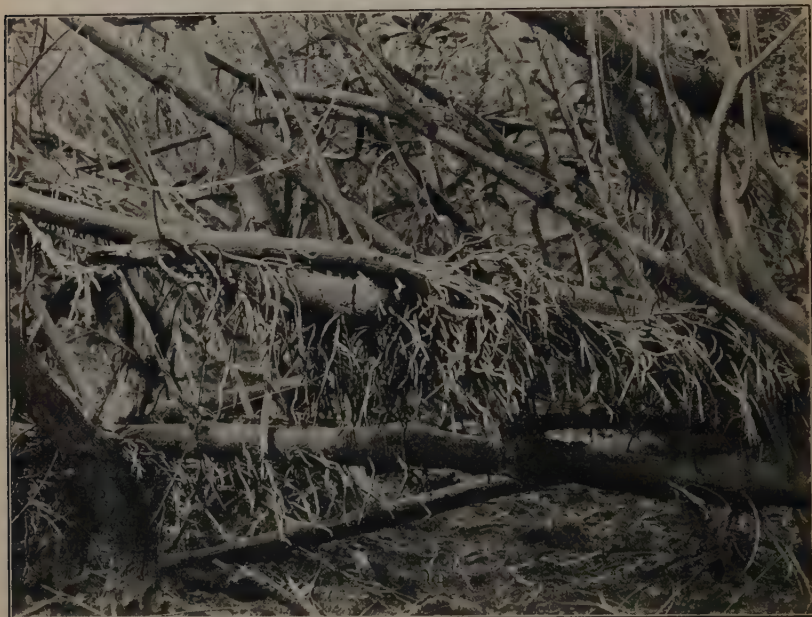


Fig. 9. *Avicennia nitida* with aerial roots. From Great Cruzbay, St. Jan.
(F. B. phot.)

The figure shows how, from the base of each pneumatophore, a vigorous food-supplying root emerges descending into the mud, and besides the root itself, has several larger or smaller suckers.

On a still drier soil, and at a longer distance from the sea, *Laguncularia* occurs, often forming quite forest-like associations. Thus on the north side of St. Croix below "Blue Mountain", in the neighbourhood of the plantations "Rust op Twist" and "La Vallée", on old lagoon substratum, we have a regular forest of *Laguncularia* (fig. 12) with rather thick trunks, 40—50 feet in height. The grayish humid soil is a sticky, clayish mass of rather firm



Fig. 10. A single aerial root from the *Avicennia*-tree shown in Fig. 9.
(Thornam del.) (about $\frac{1}{8}$ nat. size.)



Fig. 11. Young plant of *Avicennia nitida* Jacq. (Thornam del.)
(about $\frac{1}{8}$ nat. size.)

consistency, and quite devoid of vegetation; it is only covered by falling leaves and branches, among which the short, thick club-shaped pneumatophores emerge, and here and there crusts of bluish-green algae. From the base of the stem, at a height of about $\frac{1}{2}$ meter above the surface, roots in great number are sent down into the mud. This *Laguncularia*-forest passes gra-

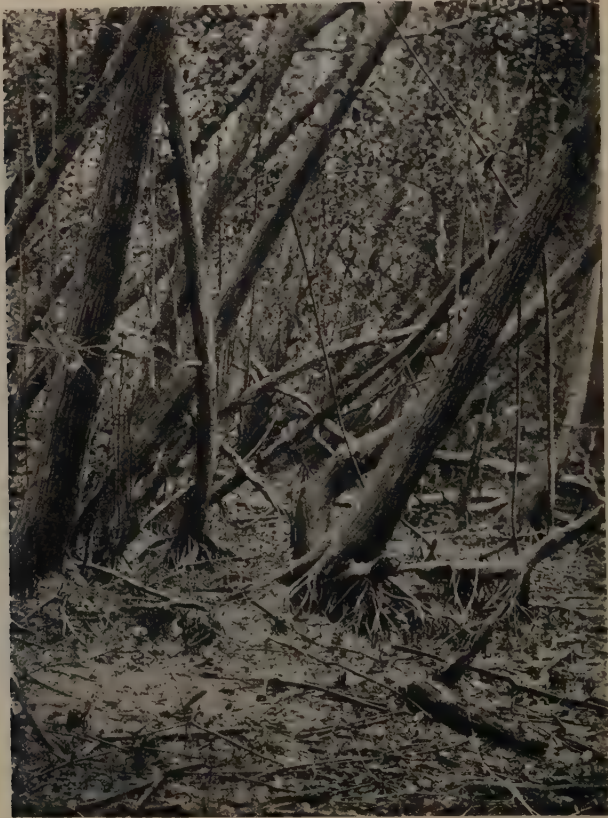


Fig. 12. *Laguncularia*-forest near the plantation Rust op Twist on the north side of St. Croix. (F. B. phot.)

dually further landwards into an *Acacia Farnesiana*-thicket which is here growing in wide stretches on similar, low, old, lagoon substratum, but where the mangrove trees have gradually disappeared.

In the preceding I have mentioned the change which gradually takes place in the mangrove vegetation, as by degrees the conditions of the soil change, and in addition to this I should like to

mention the strange alteration in Krausse's lagoon when I last visited it in January-February 1906, in comparison with its appearance during my earlier visits in the years 1892 and 1896.

Krausse's lagoon is situated on the south side of St. Croix and is an alluvial formation, produced partly by material brought from land by heavy showers, partly by deposits from the sea retained by the mangrove vegetation. Along the south side of St. Croix, and almost parallel with the coast-line at above 1—3 mile's distance, is an almost continuous coral reef, sheltering the coast against the open sea; and between the land and the reef is a rather low strait of which the depth is about 2—3 fathoms. Under ordinary conditions, even with a rather vigorous trade-wind, there is but little sea, yet sufficient enough so that localities where the coast looks towards the south-east, thus more exposed to the trade-wind, have sandy coast with sand vegetation, whereas localities looking towards the south-west and thus sheltered, have muddy soil with mangrove vegetation.

In Krausse's lagoon we have too along the south-eastern side a sand dune with the vegetation common to it, sheltering the inside, low-lying lagoon. In the south-western end of the lagoon the mangrove vegetation passes directly into the sea, here only separated by a shorter, shallow stretch of water, with seagrass vegetation and some scattered young *Rhizophoras*, from the mangrove vegetation which fringes "Kingshill's Gut" at "Fair plane".

On my previous journeys I had as earlier mentioned visited Krausse's lagoon a couple of times. Seen from the land the lagoon then appeared as a great number of more or less mangrove-grown islands with adjacent open shallow channels or bare flats (see pl. 5 in my earlier paper). Especially at the eastern end these were of rather wide extent, as I have mentioned in my paper (1898, p. 56, pl. 8 and 9, 1900, p. 52). Along the edge landwards, at all events near the plantation "Anguilla" a rather abundant mangrove vegetation occurred, which I have described (1898, p. 28, 1900, p. 25) in this way: "The largest lagoon on the Danish islands is Krausse's lagoon, which seen at a distance from the heights inland makes a splendid show with its numerous larger and smaller islands. Here I have seen the most extensive mangrove vegetation. In the neighbourhood of a little rivulet in the western part of the lagoon was found a forest entirely consisting of *Rhizophora*, growing here (at least when I visited the locality in February 1892),

on black mud and forming a rather high, shady forest below the foliage of which was only seen, as far as eye could penetrate, aerial root close to aerial root. The mud was almost without vegetation, here and there a *Herpestis Monnieria* Kth. was seen creeping, or specimens of the tall fern *Acrostichum aureum* L. (*Chrysodium vulgare*) were growing"¹⁾.

With this picture still fresh in my memory, it is easily understood that at first I could not make out where I was, when in January 1906 I visited the same locality together with Mr. Raunkiær. Already at a distance from the more elevated inland the appearance of the lagoon had astonished me. While earlier, as above mentioned, the lagoon seen from the heights had looked



Fig. 13. Krausse's lagoon seen at a short distance from the plantation Blessing.
(F. B. phot.)

splendid with its numerous wood-grown islands, it now looked most like a large, pale, gray plain with scarcely any vegetation at all.

The above photograph (Fig. 13) shows the lagoon in 1906; it has been taken at almost the same place as the above mentioned (pl. 5) in my earlier paper. One could form some notion of the change which had taken place on comparing the two photographs. Not a trace of the above mentioned mangrove forest at "Anguilla" was left, all had vanished. Directly below the more elevated land a clayish flat without almost any vegetation appeared,

¹⁾ In connection with this it may also be of interest to quote what Eggers (1878, p. 119) writes of this lagoon in his excellent description of "The nature of the Danish West Indian Islands": "In larger lagoons e. g. the above mentioned Krausse's lagoon on St. Croix, the mangrove-vegetation is often forming beautiful parts resembling a quiet lake in woody countries, often with small green islands scattered here and there over the face of the water, where the leafy crowns are hanging quite down to the surface of the water" and (p. 20) in the same paper Eggers describes Krausse's lagoon as "densely overgrown with mangrove wood".

which had an almost imperceptible slope downwards and at last in about the middle of the lagoon was covered with shallow water, and not until here, in the neighbourhood of the water, was there a belt with salt-bushes, partly *Batis maritima* L. partly *Salicornia ambigua* Mich. Out in the shallow water some quite young *Avicennia* and *Rhizophora* were growing scattered here and there. What has been the cause of this great change?

In talking with the owner of the plantation "Anguilla", Mr. Lunney, to whom the western end of Krausse's lagoon belongs, some light was thrown on the subject. St. Croix was in the year 1899 ravaged by a serious hurricane, and after this the forest had died, and then Mr. Lunney had cleared the dead forest and used it as fuel for his sugar-mill.

But why did the forest die?

On a later visit to a locality in the eastern end of Krausse's lagoon which I had visited in 1895 I believe I found the explanation. At this locality the marsh-like plains mentioned by me were earlier found. Scarcely anything was left of these or of the vegetation then existing. The ground was everywhere covered by sand and gravel, and not until at the depth of several inches was clayish soil found. According to my view the forest has died for the simple reason, that the sea, which during the hurricane has been naturally in violent agitation, has washed up great quantities of sand and gravel¹⁾ into the lagoon. The former muddy soil has thus become firmer and drier, and the vegetation then existing has not been able to accomodate itself to so sudden a change, but has died. In the western direction of the lagoon we have a large wide plain, extending over the whole interior of the lagoon, quite down to the above mentioned land at Anguilla; but while as earlier mentioned the dead forest had disappeared from this locality, some remains of it were seen here in the eastern part of the lagoon. The picture (fig. 14) shows a part of the dead forest; this seems especially to have consisted of *Avicennia*, but some *Rhizophoras* were also found. The ground was firm and rather dry so that as a rule one's feet would not sink in and was

¹⁾ The gravel consisted to a great measure of *Halimeda*-joints, which are light and of comparatively large bulk and therefore easily washed up by the sea. As mentioned p. 206 this *Halimeda*-gravel in some places is found abundantly deposited in the sea.

covered by coarser and finer sand, sometimes mixed with clay; the darker parts shown in the figure are coarse-grained gravel and snail and mussel-shells. In low-lying spots, covered with water, here and there a growth of young *Rhizophora* and *Avicennia* slowly made its appearance; sometimes these low lying spots, especially in the eastern part of the lagoon, were covered by *Ruppia maritima* L.

Seawards in the eastern exposed end of the lagoon, a rather high sand-dune appears with the ordinary sand-vegetation, which



Fig. 14. The dead mangrove forest in the eastern part of Krausse's lagoon. St. Croix. (F. B. phot.)

landwards is intermingled with *Conocarpus erecta* L., and gradually as the ground falls, evenly passes into a *Laguncularia* and *Avicennia* vegetation, in the innermost part of which *Batis maritima* L. often occurs in great numbers. This sheltering sand vegetation was in full vigour, as is seen on the picture of the lagoon (see fig. 13).

Passing from the plantation "Anguilla", down towards the lagoon, one first traverses a slightly sloping sugar-field, and then reaches an almost even, imperceptibly sloping grass plain, a *Sporobolus*-field, almost exclusively consisting of *Sporobolus virginicus* (L.) Kth. The soil which is only lying some few feet above the

surface of the sea was firm and dry and of clayish consistency. The vegetation which was dense and low, this being due to the grazing, consisted of *Sporobolus*, which formed by far the most predominant part, also of a *Chloris*-species and of *Evolvulus mucronatus* Sw. crawling among the grass and some few other species; on the lowest-lying part closest to the lagoon *Batis* was commonly intermingled. Scattered on the grass-field *Conocarpus erecta* L. appeared as low roundish bushes at about a man's height, and now and then an *Opuntia* was to be seen among the grass (fig. 21). This belt of the vegetation belongs to the *Conocarpus*-formation and is no doubt old, raised lagoon substratum, which has gradually become too dry for the regular mangrove-plants.

If this grass plain is passed, one reaches a short slope often quite steep, a few feet high, probably produced by the erosion of the sea during a hurricane, and now standing before the almost bare flat, consisting of a humid, clay and sand mixed soil. I suppose that the above described luxuriant mangrove forest lay hereabouts in 1892, and no trace of it was found now, except some few scattered stubs. While at that time one was met by an insufferable stench from all the organic deposits between the aerial roots of the mangrove, the trade-wind was now blowing fresh and cool from the sea and made the stay here particularly agreeable. Nearest to the more elevated land grown with *Sporobolus*, some *Sesuvium portulacastrum* L. and *Batis maritima* L. were found, but the surface soon became quite devoid of any vegetation at all; the uppermost crust was to a great extent dried by the sun into a mosaic (see fig. 15). Quite slightly, almost imperceptibly, the ground sloped down towards the centre of the lagoon, which was here covered with shallow water. Close to it a border with salt shrubs, especially *Sesuvium*, *Batis* and *Salicornia* arose and extended somewhat into the shallow water, and further out, some young mangroves appeared, especially *Avicennia* but also *Rhizophora*. Probably the mangrove vegetation will gradually again take possession of the ground.

This flat is, as above mentioned, in the whole eastern part, or perhaps further, divided from and sheltered against the sea by a sand-dune with its characteristic vegetation. On the remaining western part of the lagoon where the coast looks towards the south-west and is thus sheltered against the trade-wind, the mangrove is growing directly out to the sea. If one now goes for a row, one

discovers that the outermost vegetation consists of larger and smaller isle-shaped groups of *Rhizophora*. This mangrove is outermost growing in rather deep water about 2—4 feet. The bottom is formed by fine mire on which is uppermost a layer of blue-green algæ but otherwise it is without any vegetation; not until further out where the bottom is firmer and more sandy, do we find the



Fig. 15. View from the centre of Krausse's lagoon. The vegetation bordering the water consists of *Salicornia*, *Sesuvium* etc. In the water young mangrove plants are seen emerging. (F. B. phot.)

alga vegetation of *Caulerpa*, *Halimeda*, *Penicillus*, *Udotea* and others, besides sea-grass species common on such localities (comp. fig. 1). Here and there some young seedlings of *Rhizophora* are seen emerging from the water, the outermost pioneers of the advancing mangrove vegetation. Towards land these mangrove islands become larger and gradually grow together, and the water

becomes more shallow, sometimes the bottom is laid quite dry, and then it is often covered by salt-weeds especially *Batis*. In one of these channels with shallow water, growing on mangrove-roots and fallen branches, *Batophora Ørstedii* J. Ag., which Ørsted found here during his stay on the islands, occurred³ in great numbers.

On this part of the coast a considerable increase of land is evidently taking place, as all material brought in by the sea or from land by watercourses is deposited between the roots of the



Fig. 16. A *Rhizophora*-tree broken by the hurricane. The south-western end of Krausse's lagoon. (F. B. phot.)

mangrove in the stagnant water. What greatly adds to the deposit, especially of the finer mire, is the dense luxuriant growth of richly branched algae which cover the roots of the mangrove; if one touches such a root with its alga vegetation the water directly becomes turbid.

This part of the mangrove forest had evidently survived the hurricane, without suffering any greater harm yet unmistakable traces of it were seen in many places, especially upturned trees of which fig. 16 shows one. The trunk was quite broken but borne up by numerous aerial roots and was now growing vigorously. On

the whole it was only somewhat rarely that dead trees were found on this part of the lagoon.

This luxuriant mangrove forest extends as far towards the east as shelter is found, it is broadest in the western end, and at the same time as the land gets more exposed and mixed with sand it gradually narrows. *Rhizophora mangle* becomes more rare and disappears altogether, while *Avicennia* and especially *Laguncularia* still continue growing. Gradually the sand vegetation more and more predominates though intermingled with *Conocarpus* inside towards the lagoon, where too a border with *Laguncularia*, *Batis*, *Wedelia* and others occurs. This border-vegetation thus fringed the almost bare flat inside the lagoon.

Even if this description of the present state of the lagoon is in many regards far from adequate, yet it may possibly be able to give some information in the event of a later examination of its vegetation. As to how the development will take place it is difficult to offer any opinion, but most likely a greater part of the interior will be covered by *Avicennia* and *Laguncularia*, while there is less probability that *Rhizophora*-forest will arise like those which were found here before the hurricane.

2. The *Salicornia* formation.

(Cfr. Børgesen 1898, p. 56, 1900, p. 52.)

Closely connected with the mangrove formation, and growing inside its limit especially often in company with its innermost part, a vegetation of salt-bushes is found in marshy localities on the highest-lying grounds along with the *Laguncularia* association. After one of its most characteristic species it may be called the *Salicornia* formation.

This salt-bush vegetation, which in my earlier paper I have mentioned in direct connection with the mangrove vegetation in a special section: "Saltholdige Lersletter" (1898, p. 56; "végétation des plaines argileuses salines", 1900, p. 52), occurs partly and especially on the wide marsh-like flats which lie in the interior of Krausse's lagoon (cfr. fig. 15, and pl. 8 and 9 in my earlier paper), partly it also encircles the lagoons and salt ponds, where the mangrove vegetation is absent.

With the right of the strongest, the mangrove vegetation quite excludes the salt-shrubs, so that these are only found, either where

the mangroves are quite absent or where they are growing scattered. In the shade of the mangrove vegetation even where this is growing on quite dry or almost dry soil the salt-shrubs are not found, evidently as it is here too dark for the highly light-loving salt-bushes.

The West Indian *Salicornia* formation closely corresponds with the *Salicornia* formation of the Danish shores, and the West Indian species and *Salicornia herbacea* L. are also nearly related, after Raunkiær¹⁾ even perhaps the same species.

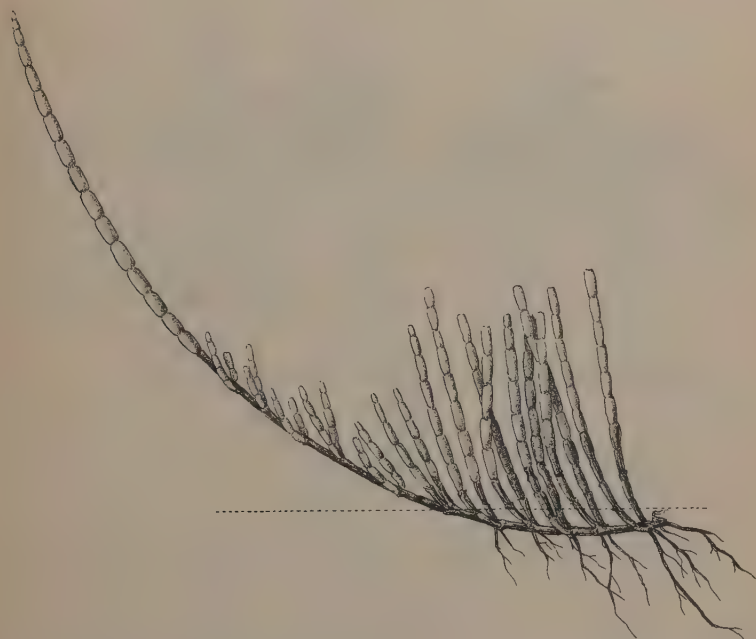


Fig. 17. *Salicornia ambigua* Mich. A rooting branch from the outside of a larger bush. The dotted line indicates the surface of the ground. About $\frac{1}{2}$ nat. size.

Of the species which compose this vegetation attention may first be called to the above-mentioned *Salicornia*, *S. ambigua* Mich. As already said it greatly resembles *Salicornia herbacea* L., but is somewhat more slender and has almost evenly thick, cylindric branches (fig. 17). The branches are sometimes erect (c. $\frac{1}{2}$ meter high), sometimes lying, rooting, and from the latter numerous side-

¹⁾ Raunkiær, C., Vegetationsbilleder fra dansk Vestindien: Krausses lagoon. Botanisk Tidsskrift. 28. Bd., p. III. København 1907.

branches emerge in such great number that dense tufts arise. The colour is dark-green sometimes with a reddish tinge. This species has only been found on these marsh-like localities in Krausse's lagoon, whereas the species yet to be mentioned can also occur in other halophyte formations.

Of other species occurring in such localities *Batis maritima* L.

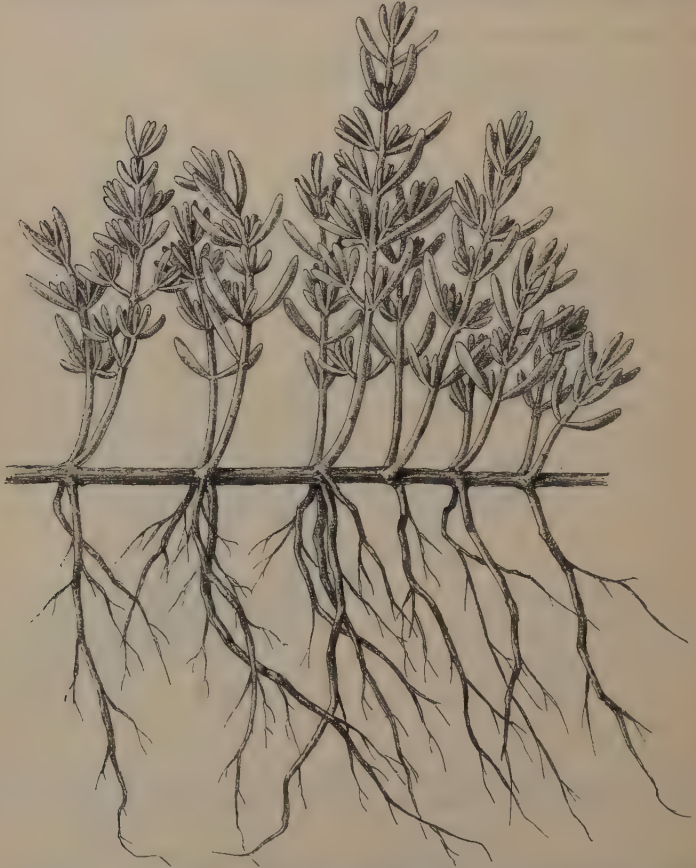


Fig. 18. *Batis maritima* L. A small part of a prostrate, rooting branch (about $\frac{1}{2}$ nat. size.)

is the most common; it has long, prostrate, rooting main branches often almost straight as a line, from which at each internode two opposite branches, the one more vigorous than the other, emerge upwards, and a similar number of roots descend towards the mud (fig. 18). The plant is commonly fresh green and has thick, fleshy, glossy, erect leaves.

Commonly intermingled among these are also *Sesuvium portulacastrum* L. (Fig. 19) and *Philoxerus vermiculatus* (L.) R. Br. both with prostrate, rooting branches. Here and there *Bacopa monniera* (L.) Wettst. is also found forming small, low, pale-green tufts. Of Gramineæ *Stenotaphrum americanum* Schrank. is particularly often seen with foot-long rooting branches.

The vegetation is commonly very scattered, the clayish soil everywhere being visible between the plants; it is rare that larger areas are covered with a more continuous growth. Especially *Batis* but also *Salicornia* often form nearly the whole vegetation,



Fig. 19. *Sesuvium portulacastrum* L. Part of a prostrate, rooting branch
(about $\frac{2}{3}$ nat. size.)

growing often belt-like in such a way that we have a distinct *Batis* or *Salicornia* association.

Besides on these larger marsh-like plains, this vegetation is also common inside the mangrove vegetation where it commonly occurs together with *Laguncularia*, where this is growing more scattered. It is especially *Batis* which is found here, and which, overshadowed by *Laguncularia*, becomes more erect than on the open localities; but in dense *Laguncularia*-forest *Batis* disappears altogether; here the ground is quite bare and the same is the case below the *Rhizophoras*, which is easily understood where this is growing in deep water but even where the bottom is nearly laid dry I have not seen any vegetation of salt-bushes below *Rhizophora*, and the reason is certainly that it is too dark here.

I may also add, that I have not found *Salicornia ambigua* growing directly close to the sea; this we could not expect where the mangrove-vegetation is present, but in the western corner of Krausse's lagoon sheltered muddy shores were found without any mangrove whatever and where *Salicornia* was also absent; it only occurred inside the lagoon. Thus *Salicornia* is of no importance in the Danish West Indies with regard to the increase of land.

3. The *Conocarpus* formation.

(Cfr. Børgesen, 1898, p. 49—51; 1900, p. 45—47.)

In my earlier paper I have, though with some reservation, referred *Conocarpus erecta* L. and *Anona palustris* L. to the mangrove vegetation. But as I have already stated in mentioning this formation, it seems to me, according to my renewed examinations, more natural to refer these species, together with others, to their own formation, and Docent Raunkiær, with whom I worked out the question during our visit to Krause's lagoon in January 1906, also agreed with me. This formation can then be called the *Conocarpus* formation after the species commonly occurring in the Danish West Indies.

With this classification we agree better with Schimper's division of the Indo-Malayan strand flora, as this formation, in any case partly, corresponds with Schimper's *Nipa* formation, but only partly, for, as Schimper himself says, the *Nipa* formation is an "Uebergangs- und Mischformation" composed of species which make very different demands on the surrounding conditions of nature, as some of the species referred here are able to grow on very humid, even water-covered substratum, e. g. *Nipa fruticans* Wurm. and others on quite dry soil; evidently this formation of Schimper does not form a natural whole. The *Nipa* growth itself, which has given the name to the formation, is most correctly, it seems to me, to be considered as a river and swamp vegetation, consequently a freshwater vegetation, and Johs. Schmidt also emphasizes this as being his opinion (l. c. p. 6). Schimper, however, mentions some species growing on drier soil related to the same vegetation, and most likely it is next to these that the West Indian vegetation corresponds. As corresponding with the *Nipa* formation Schimper also locates to Brazil *Conocarpus erecta* L. and *Anona palustris* L. among other species. Of course it would be most natural to separate this vegetation occurring on

drier soil, from the *Nipa* formation proper, with which a probably quite corresponding vegetation consisting of *Bactris* spec. (cfr. Schimper, l. c. p. 68) occurs in tropical America e. g. on Trinidad.

The soil upon which the *Conocarpus* formation occurs is certainly almost always old lagoon substratum, from which the mangrove vegetation has disappeared, as the soil has gradually grown drier and less saline. The *Conocarpus* formation therefore is most often found right behind the mangrove formation on its landward side, or at the head of bays and creeks, where the flat land



Fig. 20. Maho Bay seen from America Hill. Tortola in the background.
(F. B. phot.)

behind is often sheltered against the sea by a higher sand-dune. Fig. 20 shows such a locality in Maho Bay on St. Jan. Behind the border of white coral-sand the sandy shore-forest is seen, which shelters the lower-lying land, partly cleared and cultivated, but where remains of the *Conocarpus* formation are yet found, e. g. *Anona palustris*, *Acacia Farnesiana* and others.

The land is throughout lying so high above the level of the sea that it can only be reached by the latter with very high seas, or not at all. Commonly the soil is clayish, of a greyish colour, of more or less firm consistency, depending on the degree of dryness.

occasionally mixed with sand forming an even transition to the sandy shore, or it becomes still more firm and dry, passing evenly to the dry soil which further inland gives place to the xerophilous copses. The *Conocarpus* formation has simply to be regarded as a transitional formation from the mangrove to the sandy shore vegetation, and partly too to the inland vegetation.

Besides *Conocarpus erecta* L., which is a small tree, or more often only a bush (fig. 21), I may refer to this formation of charac-



Fig. 21. *Conocarpus erecta* L. growing on a dry *Sporobolus* plain near Krausse's lagoon. In the foreground an *Opuntia*-tuft is seen. (F. B. phot.)

teristic plants *Anona palustris* L. (fig. 22), which is also a larger bush, and *Bucida Buceras* L., which can be an even rather tall tree. Further, the stout fern *Acrostichum aureum* L. must be classed with this formation.

Conocarpus erecta L. often occurs on damp soil, but it is also to be found on even rather dry soil as well as on sandy or rocky substratum. Thus it was found as low scattered bushes on a dry *Sporobolus*-grass plain on the innermost side of Krausse's lagoon, forming here a *Conocarpus* association (fig. 21). On page 223 I have given a

description of this vegetation. A very similar vegetation Coker (l. c.) seems to have found in the Bahama Islands (cfr. his Pl. XLVI, fig. 2).

Anona palustris L. is found partly on rather swampy ground



Fig. 22: *Anona palustris* L. growing on dried lagoon soil in Saltriver Bay, St. Croix. (F. B. phot.)

in the vicinity of *Laguncularia*, partly on drier and more sandy soil. With its large dark-green leaves it has a rather conspicuous appearance (fig. 22); it has large, firstly green, later on yellow uneatable fruits, the so-called "monkey apples". *Anona*

palustris does not seem to be very common on the Danish islands; I have found it on St. Croix at Saltriver, on St. Thomas at Bovoni Lagoon and on St. Jan at the edge of the cultivated lagoon-like lowland below "America Hill".

Bucida Buceras L. is, as earlier mentioned, a larger tree which likes damp soil near the outlets of the watercourses.

We can further class with these species the large beautiful fern *Acrostichum aureum* L., which seems to be distributed in all tropical regions on a similar soil. It may be found in the mangrove formation but seems most likely to belong to the *Conocarpus* formation, where it is found sometimes on damper, sometimes also on quite dry soil.

Covering the ground where this formation grows *Bacopa monniera* (L.) Webst. is found, which with its rooting branches is creeping over the soft ground, further *Heliotropium curassavicum* L. with bluish-green rather thick leaves, just as the little bush *Corchorus siliquosus* L. is of frequent occurrence here; and *Batis maritima* L. and several other saltbushes also occur, besides different Cyperaceæ, such as *Cyperus elegans* L. and *C. ochraceus* Vahl and Gramineæ e. g. *Dactyloctenium aegyptium* (L.) Willd., the above-mentioned *Sporobolus* and several others, all species which are not entirely characteristic of the *Conocarpus* formation alone but also are more or less common to the other halophilous formations. And in the same way several other species frequently and often in great numbers join this formation, several of which are common, and even have their proper home in the dry copses. This is e. g. the case with the *Acacia Farnesiana* (L.) Willd. a species, which Schimper also refers to the *Nipa* formation. It is a tall, thorny, in the dry season leafless bush, which often covers wide areas of old lagoon ground as a dense copse-wood. In this formation, especially on St. Thomas and St. Jan, *Bromelia pinguin* L. frequently occurs in great numbers; and even plants so decidedly xerophilous as Cactaceæ make their appearance (cfr. fig. 21). When the soil begins to get more sandy, several species from the sandy shore especially the splendid tree *Terminalia Catappa* L. imported from Asia and sometimes too *Cocos nucifera* L. also appear.

An area with such a vegetation is e. g. found at the head of the large Nordside Bugt (Magens Bay) on the north side of St. Thomas. On the rather damp, clayish, gray, somewhat sand-mixed soil grows a luxuriant *Acacia* forest with numerous *Bro-*

melia pinguin and large *Acrostichum aureum* as a scattered under-vegetation on the otherwise bare soil, which on the other hand houses numerous land-crabs which are the cause of the numerous holes and mole-like heaps scattered over the whole. Here and there some groups of *Conocarpus* are growing, and further towards the west where the ground is more sandy some cocos-palm and a *Terminalia* forest make their appearance.

A quite similar area occurs on St. Jan on both sides of "America Hill" in "Cinnamon Bay" and "Maho Bay" (fig. 20) and is covered with a rather similar vegetation, *Anona palustris* also occurring here.

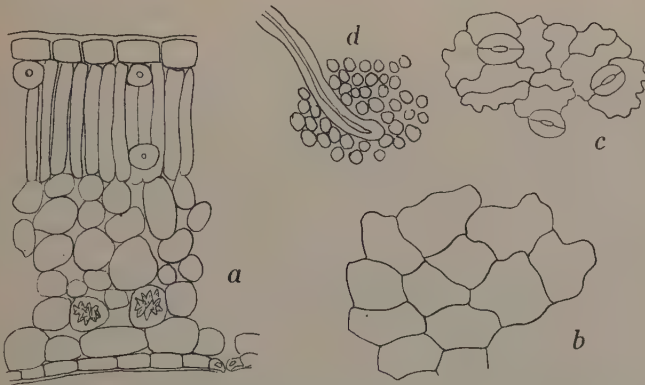


Fig. 23. *Bucida Buceras* L. Anatomy of leaf. *a*, transverse section; sclerenchyma-cells are seen between the palisade-cells. *b*, epidermis of the upper surface. *c*, epidermis of the underside. *d*, horizontal section of palisade-cells with sclerenchyma-cell. (F. B. del.)

As I have not given the anatomy of the leaf of *Bucida Buceras* in my previous paper and as it is also not mentioned by Warming in "Halofyt-Studier", I may here give a short description of it (fig. 23).

The leaf is dorsiventral. The epidermis of the upperside (*b*) has large cells with a rather thick cuticula but without stomata; seen from the surface the cells are rounded-polygonal with somewhat undulated walls.

The palisade-tissue consists of one layer of long cylindrical cells.

The spongy-parenchyma has in transverse section rounded-polygonal cells, in horizontal section they appear to be more star-shaped.

The epidermis of the underside (*c*) has smaller and lower cells

with undulated walls; the stomata lie in the same plane as the surface of the epidermis.

Round the vascular bundle a large sheath of sclerenchyma is present and from this single sclerenchyma-cells escape and are to be found round in the tissue of the leaf (cfr. *a* and *d*).

Large crystals of oxalic chalk are also present.

Long hairs occur scattered over the underside of the leaf.

II. The sand strand vegetation.

(Cfr. Børgesen, 1898, p. 4; 1900, p. 3.)

This is found on open sandy coasts exposed to the wind and naturally groups itself into the 3 formations:

1. The *Pes capræ* formation growing outermost nearest the sea on the freshest soil and consisting particularly of herbaceous plants.

2. The *Tournefortia* formation right inside on somewhat more elevated and older soil consisting of bushes, and lastly innermost

3. The *Coccoloba*-Manchineel formation growing on the oldest most elevated ground and consisting of larger bushes and trees, which may develop into a regular forest.

As already mentioned in my earlier paper, the sand of the West Indian coasts is commonly so coarse-grained that it cannot be carried by the wind. It mainly consists of chalk-gravel, partly and especially of coral-chalk but also several calcareous algæ, especially *Halimeda* but *Corallina*, *Penicillus*, *Udotea*, *Lithothamnion* and others greatly contribute to it, sometimes as already mentioned above, the sand almost entirely consists of remains from the algæ. That this coarse-grained sand is too heavy for transport by the wind is quite natural, and proper dunes are thus not found on our islands, but in some localities finer sand is to be found, and where this is the case, e. g. on the north-west side of St. Croix at the plantation "Northside", I have found a certainly very small beginning of a formation of dunes (fig. 24). The sand was here comparatively fine¹⁾. Sheltered by stones and rocks quite low mounds of sand were heaped up, on which several plants of the *Pes capræ* formation especially *Sesuvium portulacastrum* L.

¹⁾ Docent Bøggild has most kindly told me that it consisted of 93% chalk-grains, 6% slate and 1% quartz.

were growing abundantly. The sand was deposited between its closely growing and erect leaves and more or less covered these; sometimes the plant was quite overwhelmed by blown sand, but then numerous young lateral shoots emerged from the buried shoots, quickly growing erectly to the surface. Everywhere in such localities leaves and the tips of the shoots were seen emerging from the sand, whereas no long runners which elsewhere creep over the surface were seen here. In its whole mode of growth it here very much resembled *Halianthus peploides* of our shores. It has to be



Fig. 24. Low dunes covered by *Sesuvium portulacastrum* L. near the plantation "Northside" on St. Croix. (F. B. phot.)

emphasized however, that there is no question here of larger sand-drift, as only quite small areas of sand occur on this otherwise rocky shore.

As in my earlier paper I include in the *Pes capræ* formation firstly the herbaceous plants of the sea-shores, which are distinguished by their long, creeping, most frequently rooted tendrils, namely *Ipomæa pes capræ* (L.) Sw. and further, to mention the most important: *Canavalia obtusifolia* (Lam.) P. DC., *Phloxerus vermiculatus* (L.) R. Br., *Sesuvium portulacastrum* L., *Stenotaphrum americanum* Schrank, *Sporobolus virginicus* (L.) Kth. and other

grasses, besides the rare *Diodia radicans* Ch. et Schl. which I have found on "Water Island", but which on my last visit I tried in vain to find again. Of other plants I have further included the semi-bush like species *Cakile lanceolata* (W.) O. E. Schulz. (= *C. æqualis* L'Hér. in my earlier paper), *Euphorbia buxifolia* Lam. and *Heliotropium curassavicum* L.

On the other hand it seems to me most natural to refer to a special formation, the *Tournefortia* formation, the main part of the bushes, which I have earlier included in the *Coccoloba*-Manchineel formation, as most of them properly have their main occurrence outside the *Coccoloba*-Manchineel formation and only more rarely, sometimes not at all, occur in this.

Of species referable to this formation may firstly be mentioned *Tournefortia gnaphalodes* R. Br., which commonly occurs near the sea on the most exposed localities, where by means of its dense, erect, spatulate, thick, grey-felted leaves it forms almost compact, white-greyish broad growths, reaching to a height of 3—4 feet. Next to it may be mentioned *Borrichia arborescens* D. C. with yellow flowers and thick, erect, obovate-oblong leaves which most often are smooth, but sometimes silvery-hairy¹⁾. It grows gregariously often in rather dense, 2—3 feet or more high bushes on even rather exposed localities and has rooting branches. This is also the case with *Scævola Plumieri* L. of which the snake-like bent branches take root where they come in contact with the sand; in contrast to the otherwise commonly occurring narrow shape of the leaves of the bushes found here, it has broad oval, entire leaves, which are erect, very thick and only have a slightly prominent midrib.

Moreover we find the large, beautiful, densely-leaved bush *Suriana maritima* L. of which the thick, narrow, spatulate, dull and hairy leaves are quite erect and placed at the top of the branches, *Ernodea littoralis* Sw. also with erect smooth and glossy, oblong-elliptic leaves, *Bontia daphnoides* L. with smooth dark-green lanceolate leaves, *Dodonæa viscosa* L. with fresh-green obovate-lanceolate leaves, *Dalbergia hecastophyllum* (L.) Taub. with dark-green, leathery, slightly hairy leaves and of which the long somewhat hanging shoots are liable to wind wherever they find proper support, and some few other species.

¹⁾ Such specimens I saw in great number on the sandy sea-shore at the west-end of Tortola.

But it holds good for the last-mentioned species that they also occur in common with *Coccoloba uvifera* and thus very closely correspond with the *Coccoloba*-Manchineel formation.

Lastly behind the bushes of the *Tournefortia* formation follows the *Coccoloba*-Manchineel formation, yet there may be cases where



Fig. 25. *Coccoloba* association adjoining the sea. Only in the foreground a badly developed *Pes capræ* formation is seen consisting of scattered growing *Sporobolus* together with a few *Ipomæa pes capræ* and *Canavalia obtusifolia*. View from the head of Store Nordsidebugt (Magens Bay) on the north side of St. Thomas. (F. B. phot.)

the *Tournefortia* formation is wanting, sometimes even also the *Pes capræ* formation, so that the *Coccoloba*-Manchineel formation immediately descends to the bare, sometimes water-covered shore.

This is the case especially on the exposed north coasts of St. Thomas and St. Jan. (Fig. 25).

The *Coccoloba*-Manchineel formation firstly consists of the two species which have given it its name, namely *Coccoloba uvifera* (L.) Jacq. often forming an association nearest the sea, and *Hippomane Mancinella* L. inside it; both species have been described and figured in my earlier paper. In addition to this I may only add that while the *Coccoloba* is evergreen *Hippomane* according to Eggers is deciduous, as for a short time in the month of March it is said to be without any leaves, though I for my part have never seen this during my stay on the islands. Whereas *Terminalia Catappa* L. is quite leafless in February and March.

On St. Croix *Coccoloba* and *Hippomane* as a rule occur in company, whereas the Manchineel-tree is more rare on St. Thomas and St. Jan, so that there is often found here an almost pure *Coccoloba* association, or the Manchineel is replaced by the beautiful tree *Terminalia Catappa* L. imported from the Asiatic sea-shore and peculiar for its growth. And in addition to these species several others appear, firstly several of the above-mentioned bushes from the *Tournefortia* formation, and besides some others of which a more detailed description is to be found in my earlier paper. This littoral forest is also the home of the cocoanut-palm and in several places the littoral forest has been cleared and replaced by cocoanut-palm forest.

The littoral forest is often highly marked by the wind (cfr. Plate 4 in my earlier paper); it is of great importance as giving shelter to the land inside.

Referring to my earlier description, I need only describe here some photographs, which I hope will be better able to illustrate the conditions.

Plate IV thus shows the *Pes capræ* formation beautifully developed. It has been taken on the outermost point of Sandy Point, the sandy south-west Point of St. Croix. On account of the conditions of the currents, a stream running in a western direction along the south side of St. Croix and another in a southern direction along the west end of St. Croix, there have gradually been deposited at the south-west point, where the currents meet, large masses of sand, which extends as a sand bank out into the sea in a south-western direction. On the broad sandy shore a well developed

Pes capræ formation is found. *Ipomæa pes capræ* (L.) Sw. had here long runners 15—20 metres or more in length, lying on the sand; they bear short erect lateral shoots, from the base of which emerge numerous roots, and also long shoots similar to the mother-shoots, and when the latter are developed in great numbers and cross tendrils of other plants, a perfect network is formed, which altogether covers the sand. The thick fleshy leaves are as the photograph shows obliquely erect, and the two lobes are bent towards each other at almost right angles; the rain falling on the leaves thus flows down to the foot supplying roots emerging from the axil. The tips of the creeping shoots are somewhat turned upwards perhaps an adaptation against being overwhelmed by sand. If the plant should be overwhelmed by blown sand, to which it is not very exposed here in the rather coarse-grained sand, its quick growth will soon enable it to send out new shoots to the surface. For the rest, I may refer to Warming's description (l. c. p. 178) where its anatomy is also given.

Scattered among *Ipomæa* large bush-like tufts formed by *Cakile lanceolata* (W.) O. E. Schulz appear, a species which in growth and appearance is very like *Cakile maritima* Scop. While according to Schimper no Cruciferae should be represented in the tropical sandy shore vegetation, not only in India but on the whole not in the Tropics in contrast to the sea-shore vegetation of the northern coasts, we have here a characteristic representative of this family. The plant forms bush-like low tufts and has erect slightly dentated, lanceolate leaves, which as well as the branches are slightly glaucous. The anatomy is mentioned by Warming (l. c. p. 201).

Canavalia obtusifolia (Lam.) P. DC., of which the tendrils partly run over the sand partly wind round bushes and the like, occurred here and there, and also a few grasses especially *Sporobolus virginicus* (L.) Kth. with two-rowed, setaceous, folded, erect leaves on short shoots emerging from the long shoots buried in the sand, further *Cenchrus echinatus* L. and *Euphorbia buxifolia* Lam. The vegetation is scattered and one can see the white sand everywhere.

The copse in the background of the picture consists of *Coccoloba* and Manchineel more or less overgrown by *Dalbergia hecaphyllum* (L.) Taub., forming together a somewhat higher insular part of the here low *Coccoloba*-Manchineel formation, which we meet right inside the *Pes capræ* formation.

The *Coccoloba*-Manchineel formation where it starts is as above-mentioned very low and open on this dry and wind-exposed locality. Fig. 26 shows the outermost edge of this formation. To clearly understand the locality, it must be understood that the globe-shaped copse seen in the background of the Plate IV is the same as is found here in the background at about the centre. It is seen that the beginning of the *Coccoloba*-Manchineel formation is made by *Coccoloba uvifera* (L.) Jacq., which more or less espalier-like



Fig. 26. *Coccoloba uvifera* L. together with *Sporobolus*, *Canavalia* etc. creeping on the beach at Sandy Point, St. Croix. (F. B. phot.)

covers the soil in large expanses and which by means of its dry, stiff, broad, erect leaves shelters the vegetation growing behind; only exceptionally as e.g. above on the left side of the picture the *Coccoloba* is somewhat higher. A low sandbank, behind which was a broader depression, was as a rule found where the vegetation started and sheltered it; this is not clearly shown however in the picture. Intermingled between *Coccoloba* was outermost besides a few *Ipomæa* and *Canavalia* especially *Sporobolus virginicus*, but soon some other species appeared such as *Ernodea littoralis*.

Sw., a little bush which outermost is not more than a foot high, with dense, short, crooked, erect branches. What greatly adds to the rugged and stunted appearance are the persisting stipules, which on account of the very slow growth and the consequently short intervals are quite dense; under favourable conditions the internodes may be 4—5 cm. or more long, here they are often only a few mm.; the stiff, dry, glossy, elliptic-linear leaves the anatomy of which is mentioned by Warming (l. c. p. 195) are almost vertical and tend to give the plant a strongly xerophilous character.



Fig. 27. View of the inland vegetation at Sandy Point. The small tree to the left is *Erithalis fruticosa* L., that in the background *Tecoma leucoxydon* L., to the right and in the foreground *Coccoloba uvifera* L. The copses in the middle are *Ernodea littoralis* Sw., *Croton*, *Lantana* etc. (F. B. phot.)

Frequently the plant is almost quite overgrown by the parasitic *Cassytha americana* Nees which like *Cuscuta* with its yellow thread-like intermixed branches often forms a quite dense network round the host-plant. Among *Ernodea* were further *Euphorbia linearis* Retz., a little erect bush of which the branches emerge at a very acute angle from the main stem, bearing linear, erect glaucous leaves and *Rhacoma crossopetalum* L. a low bush with small ovate leaves. A few species from the *Croton*-bushes also appear, such as

Corchorus hirsutus L., *Helicteres jamaicensis* Jacq. and *Croton*-species, proving how dry and hot the locality is.

More landwards the vegetation becomes higher and gradually takes the appearance of a xerophilous copse-wood, formed by small trees and bigger bushes (fig. 27). Among the most characteristic species we meet here *Erithalis fruticosa* L. a little tree at about the height of a man or more, richly ramified, with a very characteristic appearance on account of its leaves which like rosettes are placed at the top of the branches. The leaves are broadly obovate, with decurrent margins, they are leathery and rather thick and shining. The anatomy of the leaf is mentioned by Warming (l. c. p. 234). *Tecoma leucoxydon* L. which makes its home in dry copses is also common. *Coccoloba uvifera* (L.) Jacq. is now larger and sometimes occurs as a rather tall bush, but even here at a rather great distance from the sea it is often decumbent and low, as seen in the front of the picture. Manchineel occurs only rarely or is sometimes altogether wanting. Moreover *Chrysobalanus Icaco* L. occurs in these copses; it is a smaller tree or large bush with broadly obovate leaves sparsely-placed upwards on the branches, and several others. As one gradually leaves the coast, the vegetation passes more and more into common copse-wood, as the halophytic plants are gradually replaced by inland plants from drier places. On the whole the vegetation seems to be very xerophilous, and can therefore perhaps be compared with the "Graa Klit" (gray dunes) occurring in our dunes¹). This dryness is perhaps the reason why the Manchineel is almost wanting and the *Coccoloba* so badly developed.

As mentioned in the description of Krausse's lagoon this is on the side turned towards the south-east separated from the sea by a sometimes narrower sometimes broader sand-bank with sandy sea-shore vegetation. Plate V shows a part of this vegetation on a projecting point. In the foreground some species of the *Pes capræ* formation are seen, consisting especially of *Sporobolus virginicus* (L.) Kth. and a few *Ipomæa pes capræ* L. Inside was found a luxuriant vegetation rich in species consisting of the densely hairy, gray, thick-leaved *Tournefortia gnaphalodes* R. Br. here and there forming close, low, compact growths, *Suriana maritima* L. a bush often

¹) Cfr. Warming, Eug., Dansk Plantevækst. 2. Klitterne, 1ste Halvbd. Kap. 6. Den graa Klit; Kap. 7. Busk-Klit. København 1907.

high as a man or more with fresh-green thick erect leaves and yellow flowers, and *Scaevola Plumieri* L. with broad, obovate, entire, thick leaves and rooting branches. *Dodonæa viscosa* L. with fresh-green obovate-lanceolate leaves and *Dalbergia hecastophyllum* (L.) Taub. with its leathery, slightly hairy, dark-green leaves and somewhat hanging shoots. This lower bush-vegetation evenly passes, as is seen to the right of the pictures, into the *Coccoloba*-Manchineel formation, consisting of *Coccoloba uvifera* (L.) Jacq. intermingled with *Lantana involucrata* L. with mauve flowers luxuriantly growing in



Fig. 28. Sandy beach near the plantation Longford on the south side of St. Croix. In the middle of the picture low dense grayish growth of *Tournefortia gnaphalodes* R. Br., the bush in the foreground is *Suriana maritima* L. surrounded by *Sporobolus virginicus* and a few *Ipomoea*. In the back-ground the *Coccoloba*-Manchineel formation. (F. B. phot.)

large groups and *Hippomane Mancinella* L., besides a few *Conocarpus erecta* L., recalling the vicinity of the lagoon behind. Here and there *Guilandina Bonducella* L. was seen climbing by means of its numerous, backwards bent thorns on the branches and leaves.

Fig. 28 shows a part of the sandy shore further to the east

on the south side of St. Croix, almost directly south of Christianssted on the plantation Longford. The foreground of the picture shows the *Pes capræ* formation which appears as a border along the coast in front of the bushes; it mainly consisted of *Sporobolus virginicus* (L.) Kth., *Stenotaphrum americanum* Schrank, *Cenchrus*



Fig. 29. Forest of *Hippomane mancinella* L. near the plantation "Rust op Twist" on the north side of St. Croix. (F. B. phot.)

echinatus L., *Dactyloctenium ægyptium* (L.) Willd., besides here and there *Euphorbia buxifolia* Lam. and *Heliotropium curassavicum* L. and a few tendrils of *Ipomæa pes capræ* Sw. and *Canavalia obtusifolia* (Lam.) P. DC.

The bush in the foreground is *Suriana maritima* L., and behind it are large, dense, grayish growths of *Tournefortia gnaphalodes*

R. Br. *Daibergeria hecastophyllum* (L.) Taub. was also found and several others. The dark belt of wood in the background is the *Coccoloba*-Manchineel formation, in front consisting of *Coccoloba*, behind of *Hippomane mancinella* L. On this belt of wood the wind



Fig. 30. *Guilandina Bonducella* L. climbing on manchineel, *Coccoloba* etc. in the strand forest near the plantation Rust op Twist, St. Croix.
(F. B. phot.)

had evidently left its traces, as the crowns of the trees were inclined towards the sea as if they had been cut artificially.

In the hitherto mentioned localities the manchineel has not been particularly vigorously developed; on the other hand, I have seen a beautiful manchineel vegetation on the north side of St. Croix, on

the sandy coast south of Hams Bluff near the plantation "North-side" and on the north coast from the plantation "Rust op Twist" in westerly direction as far as the sandy shore extends. Here a regular forest with imposing old manchineel trees is to be found, through which winds the north-side road. Fig. 29 shows a part



Fig. 31. *Terminalia Catappa* L. at the head of Store Nordsidebugt on the north side of St. Thomas. (F. B. phot.)

of this forest in the neighbourhood of the plantation Rust op Twist. The trees here certainly reach to a height of at least 60 feet. They have a very dense roof of foliage, and the ground is therefore without any vegetation, only just at the sea, where the vegetation is more scattered, some other species are found intermingled, e. g. *Coccoloba uvifera* and *Guilandina Bonducella* L. which as a roof-shaped cover spreads over for example *Coccoloba* and other smaller trees

and bushes (see fig. 30). This manchineel forest reaches landwards to the lower-lying lagoon-like stretches with *Laguncularia* forest which is mentioned under the mangrove vegetation.

In the sand vegetation of the north side of St. Croix is often found *Thespesia populnea* Cav. and *Terminalia Catappa* L. imported from Asia and common in the *Barringtonia* formation. They are also common in St. Thomas, in any case *Terminalia Catappa*, which at several places e. g. at the head of Magens Bay almost forms a forest-like vegetation (see fig. 31).

As I have not mentioned the anatomy of the leaf of the following species in my paper and as Warming in "Halofyt-Studier" also does not mention the subject, I may give here a short description of them.

Dalbergia hecastophyllum (L.) Taub.

The leaf is dorsiventral. The epidermis of the upper-side (fig. 32, *b*) consists of rounded-

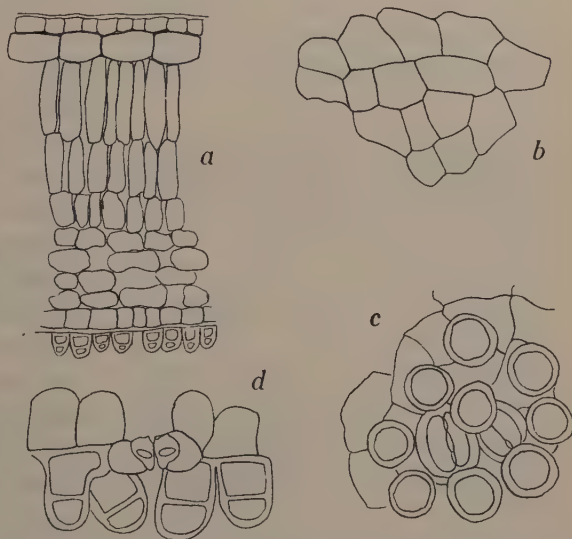


Fig. 32. *Dalbergia hecastophyllum* (L.) Taub. Anatomy of the leaf. *a*, transverse section of leaf. *b*, epidermis of the upper surface. *c*, epidermis of the underside. *d*, stoma.

polygonal, low cells, with a rather thick cuticula; it lacks stomata.

Beneath the epidermis we have a rather large-celled hypoderm (fig. *a*), then follows the palisade-tissue, consisting of two—three layers of cells, of which the uppermost are cylindrical, while the undermost are short, barrel-shaped. The cells of the spongy-parenchyma have in transverse section a rounded-subquadrate form, with rather large intercellular openings.

The epidermis of the underside (fig. *c*) bears numerous thick-walled papillæ, divided by a wall parallel with the surface into two cells; occasionally also a vertical wall occurs. The stomata, pro-

tected more or less by the papillæ (fig. 32 *d*), are lying nearly in the plane of the epidermis and have two guard-cells.

Crystals are found in the mesophyll. Scattered, stiff, dagger-like hairs occur, and further a very few gland-hairs.

A short description of the anatomy was earlier given by F. Köpff¹⁾.

Dodonæa viscosa L.

The leaf is dorsiventral. The epidermis of the upperside has rather large polygonal cells, with a rather thick cuticula, and no stomata (fig. 33 *a*, *b*).

The palisade tissue consists of two layers of cells, of which the uppermost has narrow cylindric cells, the undermost, on the contrary, more irregularly shaped cells. The spongy-parenchyma has in transverse section irregularly shaped cells, the undermost layer being somewhat lengthened.

The cells of the epidermis of the underside are also polygonal, but much smaller than those of the upperside. The stomata reach a little over the surface.

On both sides of the leaves large, flat, somewhat depressed gland-hairs occur.

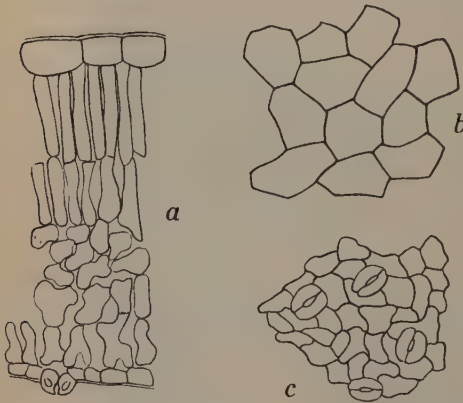


Fig. 33. *Dodonæa viscosa* L. Anatomy of leaf. *a*, transverse section. *b*, epidermis of the upperside. *c*, epidermis of the underside.

III. The rocky coast vegetation.

(Cfr. Børgesen, 1898, p. 27; 1900, p. 24.)

Nearest the sea a lichen-belt will certainly be found everywhere on the rocky shores; and close above highest water mark in localities inaccessible to the sun are also to be found a few species of algæ e. g. *Bostrychia*-species, *Lithothamnion*, *Enteromorpha*, *Chætomorpha antennina*, *Ralfsia* besides bluish-green algæ and others, a vegetation very similar to what I have already described

¹⁾ Köpff, Fr., Ueber die anatomischen Charactere der Dalbergieen, Sophoreen und Swartzieen. Diss. München 1892.

with respect to the Faerøes¹⁾, and which Warming has mentioned in his Danish vegetation²⁾. But in comparison with the Faerøese vegetation, the West Indian is of much more modest extension. Thus the algæ scarcely reached more than a foot above highest water mark and only in localities most protected from the sun; the halophilous lichens³⁾ reach most probably somewhat higher and pass evenly into the non-halophilous rock lichens growing higher up.

Unfortunately I have not had the opportunity of making any collections on the most exposed shores, as, at the times I tried, it was impossible to land on account of the surf. In some more sheltered localities e. g. on St. Jan in Cruzbay at Christiansfort, a very rich lichen vegetation is growing right down to the sea and something similar I have seen several times on the coasts of St. Croix and St. Thomas in some more sheltered localities e. g. in Magens Bay. This lichen belt is broader or narrower according to the condition of the coast, on particularly exposed coast on the north side of the islands the phanerogamous vegetation does not begin until at a height of many feet above the sea level, whereas higher plants on sheltered rocky coast can go almost right down to the highest water mark.

While the lichens and algæ are able to attach themselves to the naked, steep rocky wall, flowering plants demand some cracks or depressions with earth or some other loose material, or, what can only be the case on slightly sloping or almost horizontal rocks, a layer of earth on this.

One of the first occurring Phanerogams on more sheltered coast is *Sesuvium portulacastrum* L. (cfr. fig. 39), with often more than metre long branches, which entangled into each other in long garlands hang down the lichen-grown rocks, attached to cracks, or earth and sand-filled depressions. It often here appears in a somewhat more xerophilous form than on the sandy shore, thus the leaves are smaller, often nearly half as long, some-

1) Børgesen, F., The algæ-vegetation of the Færøese coasts (Botany of the Færøes, Part III, København 1905, pag. 711: The Hildenbrandia-Formation).

2) Warming, Eug., Dansk Plantevækst. 1. Strandvegetation. København 1906, pag. 5: Klippekystens Plantevækst.

3) I assume that special halophilous lichens are found here as well as along the northern coasts, but what species they are, Dr. Wainio who is most kindly determining my lichens, has not yet been able to tell me.

times they are almost quite roundish (fig. 34). The colour of the plant also differs, as the rocky-form is deeply red-coloured in contrast to the fresh green colour of that of the sandy shore. At the base the stem is surrounded by a thick uneven cork-like mass.

Philoxerus vermicularis (L.) R. Br., of which the mode of growth quite corresponds with that of *Sesuvium*, often occurs together with this; further, *Euphorbia buxifolia* Lam., *Stenotaphrum americanum* Schrank, *Paspalum distichum* Sw. and several other species may be found on rocky coast. As will be seen it is chiefly the same species as found on the sandy shore.

Inside these lower herbaceous or only partly ligneous species several larger and smaller bushes gradually make their appearance. At Judiths Fancy on the north side of St. Croix, a very exposed



Fig. 34. *Sesuvium portulacastrum* L. from rocky shore (about $\frac{1}{2}$ nat. size.)

locality where the foam of the surf is often tossed far into the land by the trade-wind, *Borrchia arborescens* D. C. was thus found. It was growing in cracks of the rock with a little clay and gravel into which its rooting branches could fix themselves. It has small, fresh-green, obovate-oval, thick leaves and was here only 1—2 feet high; further, *Jacquinia armillaris* L. was found; it was about 1 foot high and had stiff erect, folded yellow-green leaves and white flowers. Also *Tournefortia gnaphalodes* occurred here on rocky coast and several other bushes, e. g. *Scævola Plumieri*, from the sandy beach.

Further west at Saltriver the shore slopes up more or less sharply from the sea, and the rocks are here covered by a rather low but extremely dense copse vegetation (fig. 35). The North-side Road here winds through the copse, so that there were ample opportunities of examining its composition. Nearest the sea but yet at some distance from it *Coccoloba uvifera* occurred, as the first outpost. Shaped like an espalier it expands itself prostrate on

the rocks, rooting and attaching itself to crevices in these. Landwards it gradually gets taller, giving shelter to a great many species. Of other *Coccoloba*-species are here present *Coccoloba diversifolia* Jacq. with broadly obovate, leathery, dark-green leaves; and *Coccoloba microstachya* Willd., a richly and densely ramified bush, of which the leaves in the most exposed localities are quite small and oval scarcely more than a few centimetres long, in more sheltered localities turning lanceolate and 10—12 cm. long.



Fig. 35. Dense copse vegetation from the rocky coast on the north side of St. Croix, west of Saltriver Bay. (F. B. phot.)

By means of the exceedingly rich ramification and the close, small, leathery, stiff leaves, it forms a quite compact mass through which the wind cannot penetrate (cfr. fig. 35). The central part of the picture is essentially this species.

Among these larger bushes and small trees were found *Baccharis dioica* Vahl a little bush, with close ramification and erect branches and small obovate, erect, smooth and glossy leaves, *Jacquinia armillaris* L., *Elæodendron xylocarpum* DC. and *Plumieria alba* L., the latter being partly leafless from February to March, and with its stiff thick branches standing out in the air appearing strange and different from the other vegeta-

tion. *Euphorbia linearis* Retz. was often seen below and among the higher bushes, and further *Croton flavens* L., *Anthacanthus spinosus* Ns., *Heteropteris purpurea* (L.) H. B. K., *Piscidia piscipula* (L.) and many other species. Even if several of the just-mentioned species may also be found further landwards and thus cannot absolutely be considered as halophytic, they are all here stamped by the effects of the proximity to the sea. With a vigorous trade-wind the spray of the sea can reach far up the rocks, and rather far into the country where this is open. However it is especially the effect of the wind which makes itself felt, as trees and bushes are



Fig. 36. Low, tufted vegetation on the rocky, stony coast at Hams Bluff, St. Croix.
(F. B. phot.)

everywhere as if artificially cut, evenly sloping upwards towards the land and forming a dense roof of foliage.

On almost horizontal or only slightly sloping rocks, where these are covered by a layer of earth, and where the locality is so exposed that a higher tree-like vegetation is wanting, a strange, low, tufted vegetation occurs almost resembling the flora of a mountain-field.

Such a vegetation I have observed partly on the above-mentioned much exposed rocky coast at Judiths Fancy, partly also at Hams Bluff, the north-eastern wind-blown promontory of St. Croix (fig. 36). The effect of the wind is most noticeable especially at Judiths Fancy. The coast here turns in a north-western direction so that the north-east trade-wind has full play, often sending the

fine spray from the sea far over the land. On the stony clayish beach, where now and then rocks emerge, the vegetation consists of a quite low dense dark-green cover 1—3 inches high. The greater part of the vegetation is *Dactyloctenium ægyptium* (L.) Willd., with quite short 1—2 cm. long, pruinous, long-haired leaves, and intermingled with it *Sporobolus virginicus* (L.) Kth. Among these grasses were growing low, dense mounds of *Pectis humifusa* Sw. with fresh-green, small, smooth, rather thick, stiff leaves and yellow flowers and *Tephrosia cinerea* (L.) Pers. with grey-felted unevenly pinnate leaves. Scattered among the grass the thick-leaved *Portulacca oleracea* L. with prostrate stems appeared and *Talinum triangulare* (Jacq.) Willd. with thick tuberous roots, and fleshy linear leaves, and lastly, *Lippia nodiflora* Rich. with its



Fig. 37. *Croton flavens* L. A wind-blown specimen from Judiths Fancy, St. Croix. (F. B. phot.)

rooting branches was creeping here and there among the grass. In a few places where the soil was more sandy, there occurred some small stunted tendrils of *Ipomœa pes capræ* with enormously thick leaves, or a small *Opuntia*-mound was prominent.

This vegetation reaches rather far into the country, and passes gradually into low *Croton*-copse. At first the *Croton*-bushes are quite espalier-shaped, adhering tightly to the ground with all the branches turning the same way, like a banner blown away by the wind. Fig. 37 shows a photograph of such a *Croton*-bush.

And not only are these smaller bushes stamped by the enormous power of the wind, but the *Coccoloba* and the manchineel are also bent to the ground by it. Here and there on the slightly sloping flat were found some scattered growing specimens of these species which were all more or less lying tightly pressed against the ground.

Fig. 38 shows such a manchineel tree. The knotted trunk directly faces the wind, while the flatly spread crown turns away from the wind in a south-western direction. The trunk was 15—20 cm. in diameter and the crown almost 10 metres long and where it was highest $1\frac{1}{2}$ meter high; the roof of foliage was quite dense though several dead branch-tips were emerging. Similar flat mounds were also to be seen of *Coccoloba*.

On stony clayish soil along Hams Bluff a vegetation very similar to that of Judiths Fancy occurred (fig. 36). The locality is also here highly exposed, and the spray from the sea is tossed far into the country.



Fig. 38. Manchineel tree bent to the ground by the wind. From Judiths Fancy, St. Croix. (F. B. phot.)

The vegetation nearest to the sea is scattered, consisting of *Pectis humifusa* Sw. which finds shelter behind the here frequently occurring stones. In addition to it appear some grasses such as *Dactyloctenium aegyptium* (L.) Willd., *Sporobolus virginicus* (L.) Kth. and *Stenotaphrum americanum* Schrank. Further, *Lithophila muscoides* Sw. with very small, linear or slightly spatulate leaves, *Desmodium triflorum* (L.) DC. with small ternate leaves, *Alysicarpus nummularifolius* (L.) DC. with small ovate-oval leaves, *Portulacca oleracea* L. var. *parvifolia* Griseb. with small, thick fleshy leaves. All these species form a quite low, dense cover which only at a considerable distance from the sea passes into copse.

If we now turn our attention to St. Thomas and St. Jan, the

coasts of which are mostly rocks, we should probably meet most of these species, but in addition to these a great many succulent plants, common on these rocky islands, especially *Agave*- and *Cactus*-species.



Fig. 39. Rocky coast on the east side of Magens Bay, St. Thomas. Below to the left *Sesuvium portulacastrum*, in the middle *Opuntia* and also *Cereus* and *Agave*. (F. B. phot.)

On the east side of Magens Bay on the north side of St. Thomas the rocky coast consists partly of stationary rocks partly of larger and smaller blocks of stones, as the above picture shows (fig. 39). Nearest the sea bluish-green algæ were growing on these rocks, and now and then in dark crevices *Enteromorpha*- and *Bostrychia*-species

were also seen, but further up the rocks were covered by lichens. *Sesuvium portulacastrum* L. and *Philoxerus vermicularis* (L.) appeared as the first flowering plants and intermingled with them well-developed *Cereus*- and *Opuntia* species, which here at so short a distance from the sea may be washed over by it.

On the south side of St. Thomas and on the islands round the harbour of Charlotte Amalie the Agaves were often growing right down to the sea. The accompanying picture (fig. 40) has



Fig. 40. Agaves, *Plumieria*, *Cereus* etc. growing on rocky coast near the entrance to the harbour of St. Thomas. (F. B. phot.)

been taken at the east side of the entrance to the harbour near the Quarantine station; it shows the Agaves on the steep rock almost down to the level of the sea. With their huge yellow inflorescences, which like a luminous torch often stand 20—30 feet or more out into the air, they made a splendid show and perhaps more than anything else gave pronounced proof of what a tropical climate even in this dry and sparse locality can produce.

On the north side of St. Jan one also meets a little *Thrinax*-species¹⁾, growing among Agaves and Cactaceæ often rather

¹⁾ What species it is, I cannot tell, most probably several species occur on the islands. A specimen which I have brought home, found on the heights

near to the sea. It was thus particularly abundant on the steep rocky coast of the little island Loango but also at other places, e. g. Whistling Cay and on the north side of St. Jan; thus, a great many of this elegant little palm were growing on Mary Point. As just mentioned, it is only on the north side of the islands that *Thrinax* was found, on the far drier south side this palm was absent.

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of St. Thomas at Magensbay estate, and now placed in the Botanical Museum, Copenhagen, has been described by Beccari as a new species, *Coccothrinax Sancti-Thomæ* Becc. (O. Beccari, Le Palme Americane della Tribù delle Corypheeae. Firenze 1907, p. 303).

Studier over danske Hedeplanter Økologi (II. *Arctostaphylus*-Typen).

Af

A. Mentz.

Blandt Lyngplanterne paa danske Heder kan *Arctostaphylus uva ursi* (L.) Spr. og *Vaccinium vitis idaea* L. ved Fællesskab i Organisation naturligt henføres til samme Livsform: *Arctostaphylus*-Typen. Ligesom for den tidligere omtalte *Genista*-Types Vedkommende (24)¹⁾ afhandles hver af disse to Arter for sig; til Slutning sammenfattes Typens Ejendommeligheder i en kort Oversigt.

Arctostaphylus uva ursi

er som bekendt en højnordisk-alpin Art; de væsentligste Facta m. H. t. dens Verdens-Udbredelse er nylig samlede af C. Schroeter (36).

Til Danmark er den formodentlig indvandret snart efter Istidens Ophør. Efter E. Warming (46) hører den til de af Tundra-markens Planter, som indfandt sig i vort Land i den sénglaciale Tid. Siden hen gik den sammen med andre Lyngplanter over i Hedesamfundet, hvoraf den nu, som sikkert tilforn, danner en meget væsentlig og karakteristisk Bestanddel. At den her optræder som Overlever fra hint antagne ældgamle Plantesamfund, Tundra-marken i Danmark, er sandsynligt nok, selv om *Arctostaphylus uva ursi* endnu ikke er paavist i Jordaflejringer fra hin Periode med samme Sikkerhed som i Skandinavien; jvfr. Hartz (11) og G. Andersson (2).

Indenfor Danmarks Grænser er *Arctostaphylus uva ursi* alene udbredt i Jylland (derunder Læsø)²⁾. Og i Jylland er den nøje

¹⁾ Tallet her og videre frem henviser til Litteraturlisten i Afhandlingens Slutning.

²⁾ Hornemann angiver den i sin Flora fra Tisvilde-Egnen, men den er ikke senere genfundet der; jvfr. H. Mortensen (25).

knyttet til Hedeegnene; den forekommer derfor næsten overalt, hvor Heden overhovedet har nogen Udstrækning, baade mod Øst og mod Vest, men hyppigst i Midt- og Vest-Jylland, saaledes som allerede J. W. Hornemann (14, S. 174) har bemærket om Melbærriset, „den eneste Plante, som paa nogle Steder prøver at gjøre Lyngen Pladsen stridig“.

I sin hele Optræden viser *Arctostaphylus uva ursi* sig dog langt mere begrænset end dens nære Slægtninge: *Calluna* og *Erica tetralix* og *Empetrum nigrum*, med hvilken den i flere Henseender har økologisk Lighed. Denne Begrænsning i Optræden vil fremgaa af det følgende.

Det er saaledes særdeles karakteristisk, at *Arctostaphylus* først meget sent synes at indfinde sig paa unge eller yngre Heder, specielt Klithederne, hvor Jordbunden dog er af den Art, at den meget vel maa kunne tilfredsstille de Fordringer, som Melbærriset stiller i denne Retning, og hvor de 3 ovenfor nævnte „Lyngplanter“ stedse vil indvandre, saa snart Forholdene er gunstige nok. Jeg skal senere vende tilbage til dette Forhold, blot her bemærke, at jeg ingensinde har set *Arctostaphylus* som „Klitdanner“, saaledes som Cowles skildrer den optrædende i Klitterne ved Lake Michigan (4, S. 188 o. a. St.).

Alligevel er *Arctostaphylus* ikke alene knyttet til diluviale Heder¹⁾, men den træffes ogsaa paa Alluvialbund, der er forholdsvis gammel. Eksempelvis kan det nævnes, at den i Mængde vokser paa Rimmerne mellem Hals og Sæby; efter Ostenfeld (29) ses den i Rendborg Hede, og efter M. L. Mortensen (26) er den Karakterplante paa Klitheden mellem Altonahuse og N. Elkær. Endnu nordligere bliver den vistnok sjældnere; i den nordligste Del af Skagens Odde er den i Følge E. Warming set ved Bunken (45) og i Mængde ved Jerup (48, S. 162, hvor det nævnes, at denne Plante er „sjælden i de egentlige Klitheder“).

Ligesom *Calluna* og *Empetrum* o. a. Hedeplanter stiller *Arctostaphylus uva ursi* ganske sikkert meget beskedne Krav til Jordbundens Indhold af Næringsstoffer. Som den nu optræder i Heden, er den en udpræget Morbundsplante, men den maa jo oprindeligt antages at have indfundet sig paa mineralsk Bund, navnlig paa Sandbund, hvor den ogsaa nu, om end forholdsvis sjældent, kan træffes.

¹⁾ C. Raunkiær (32) regner den til de Planter, der særlig holder sig til Rullestenssandets Heder.

t. Eks. i Mængde i Torsted Sande (Hedens Indsande synes iøvrigt at være ugunstig Jordbund for dens Trivsel). I Sammenhæng hermed kan det nævnes, at den indenfor den diluviale Hede forekommer saavel paa Bakkeøer som paa Flader.

Overfor Jordbundens Fugtighedsforhold viser *Arctostaphylus* en mere konstant Optræden end Flertallet af vore indenlandske „Lyngplanter“. Ti den lever som Regel kun i den tørre Calluna-Hede, undgaar Erica-Heden og vokser aldrig i Hedens Kær eller i Lyngmoser; at den undgaar Moserne, er allerede nævnt af Focke (7). Ofte angiver den slaaende smukt Grænserne for de to Formationer, hvor Lynghede og Lyngmose mødes. Saaledes i det ovenfor nævnte Terræn: Ulsted Rimmer og Ulsted Mose. Her veksler lave, hedeklædte Rimmer med lyngmosefyldte Dobber; ofte er Forskellen i Niveauet mellem de to Formationer meget ringe, og Vegetationsdækket, som i saa mange Henseender er ens for Rimmer og Dobber i denne Egn, synes ved første Øjekast ikke at give noget Holdepunkt for Adskillelsen. Men meget hurtigt vil man finde, at man ved Hjælp af *Arctostaphylus* kan orienteres i Forholdene, idet den vokser i Mængde paa alle Rimmer, just til Grænsen mellem Rimmer og Dobber, og ganske mangler i Dobbernes Lyngdække.

Arctostaphylus uva ursi er ubetinget lyselskende; den forekommer derfor ikke i Jyllands naturlige eller kunstige Skovsamfund. Baade Løvskovene (derunder Krattene) og Naaleskovene undgaar den. End ikke i de lyse Fyrreskovene synes den at forekomme, f. Eks. ikke i Fyrreskov-Partierne nær Silkeborg, der omtales lidt nærmere senere hen; disse Plantninger er aabenbart for tætte, meget mindre aabne end de Fyrreskovene, hvori den optræder i vore Nabolande mod Nord og Syd. Efter Graebner (10, t. Eks. S. 239) slutter den sig oftest til Fyrreskoven. Han siger: „Nicht selten allerdings begegnet man ja kleineren Beständen der Bärentraube auch auf offenem Gelände; aber diese Vorkommnisse treten doch so zurück hinter dem massenhaften Auftreten unter Kiefern, dass diesem als den typischen der Vorzug zu geben ist.“ I Danmark er den derimod i Nutiden knyttet til den skovløse Hede, og fra dens Optræden her er der nu intetsomhelst, der berettiger til en Slutning som Graebner's, at den „liebt . . . einen gewissen Windschutz und leichte Beschattung durch buschige oder vereinzelte Kiefern“ (S. 153). Maaske har Forholdet været et andet, da Skovfyrren levede her i Landet; det er jo muligt, at den dengang har været

en konstant Ledsager af Fyrren paa „Fyrreheder“. Efter Fyrrens Forsvinden har den i saa Fald holdt Stand i Heden, ganske upaa-virket af Mangelen paa Beskygning. I alt Fald Løvskovene har *Arctostaphylus* ingensinde søgt. Ti sammenlignende iagttagelser dels fra Heder nær Løvskov (og Rester deraf), dels fra Heder, hvor Skove nu mangler eller maaske aldrig har staaet, kunde tyde paa, at den nu raadende Udbredelse af *Arctostaphylus* staar i et vist Afhængighedsforhold til Præeksistensen af Løvskov. — For den vegetative Udvikling af *Arctostaphylus* synes Ekspeditionens Art at være uden Betydning.

Paa de (ikke talrige) Kimplanter eller ganske unge Planter, jeg har fundet i Naturen, ses det, hvorledes Primroden vokser kraftig til, og et Par Cm. under Jordens Overflade sender meget svagt positivt geotropiske Rødder ud til alle Sider. Medens disse Rod-grene breder sig lige i Overfladen af Jorden, trænger Primroden betydelig længere ned; den er ganske vist længe levende, men har næppe nogen synderlig Betydning for ældre Individuer, hvis lange krybende Skud hurtig forsynes med Adventivrødder. Disse dannes, som omtalt af Warming (44, S. 46), ikke i nogen stor Mængde; i det man forsøger at løsrive Grenene fra Jorden, mærkes dette let — lange Stykker fjærnes uden synderlig Modstand. Adventivrødderne er oftest temmelig korte og holder sig kun til Lyngskjolden; undtagelsesvis gaar de dybere. De giver altsaa ogsaa deres Bidrag til Humuslagets Opbygning.



Fig. 1. Mykorrhiza af *Arctostaphylus uva ursi*. Ca. 35:1.

Mykorrhizadannelsen er paa Adventiv-Rødderne særdeles livlig, men fremkommer forøvrigt ogsaa paa Kimplanternes Primrod i deres første Leveaar. Mykorrhizerne er ca. 1 Mm. lange, i Spidsen koralformet grenede og naturligvis forholdsvis stærkt opsvulmede (se Fig. 1); de minder ikke lidet om de buskede og dikotomt forgrenede Mykorrhizer hos Bjærgfyr, der er beskrevet af P. E. Müller (27, S. 16, Fig. 2). Saa vidt mig bekendt, er Mykorrhizerne hos *Arctostaphylus uva ursi* ikke tidligere omtalte; hverken Frank

(9) eller Höveler (15) nævner dem; jeg tillader mig derfor at anføre en lidt skematiseret Figur af Tværsnittet af en Mykorrhiza-Gren (Fig. 2). Heraf ses det, at Hyferne danner en tæt Kappe eller Skede udenom selve Rodlegemet,

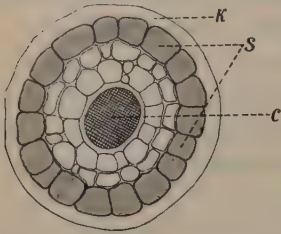


Fig. 2. Tværsnit gennem en Gren af Mykorrhiza af *Arctostaphylus uva ursi*. K, Hyfe-Kappe. S, Epidermis. C, Centrally cylinder. Ca. 170:1.

og at kun Epidermis, der iøvrigt er ret voluminøs, er fyldt af Hyfetraade i en kompakt Masse. Som hos *Diapensia lapponica*, hvis Mykorrhizer er fundne og beskrevne af H. Hesselman (12, S. 25), er Mykorrhizerne her hverken egentlig endotrofe eller helt ektotrofe, men, som Hesselman angiver det for *Diapensia's* Vedkommende, nærmest paa Overgang mellem de to Former. Hyfekappen synes endda her betydelig sværere end hos

Diapensia (jvfr. Tav. 1, Fig. 8 hos Hesselman). — Mykorrhizer træffes ingenlunde altid hos *Arctostaphylus*, men saavel paa humøs som paa afgjort sandet Bund.

Voksemaaden hos *Arctostaphylus uva ursi* er delvis skildret af E. Warming (44, S. 46), senest paa Grundlag af Materiale fra arktiske Egne (47, S. 39). Han opfører den blandt de „overjordisk vandrende Væxter med længe levende Primrod.“ Et og andet kan anføres til Supplering af Warming's Fremstilling.

De af mig fundne, lidt ældre Kimplanter¹⁾ har alle forgrenet sig i andet eller tredje Aar, og Dannelsen af Sideskud synes stedse at være rigelig. Undertiden ser man, at Hovedskuddet af en eller anden Grund er døet bort; i saa Fald vil de fremkomne Sideskud hurtig give Erstatning. Men hvis Hovedskuddet persisterer, vil man finde, at det meget snart (i andet eller tredje Aar) bøjer sig horisontalt; det er utvivlsomt transversalt



Fig. 3. Toaarig Kimplante af *Arctostaph. uva ursi*, svagt formindsket.

¹⁾ Omtale af Kimplanter har jeg kun fundet hos N. Sylvén (39) og E. Warming (47, S. 39).

geotropisk (Fig. 4). Paa samme Maade forholder ogsaa Sideskudene sig; deraf den krybende Voksemaade. Dog er Spidsen af Skuddene gjerne svagt opad bøjet.

De vegetative Skud fortsætter monopodiale deres Vækst; desuden dannes der, især fra de øverste Bladhjørner, et eller oftest flere, sjældn mere end 10 Cm. lange Sideskud, som alle vokser omtrent lige kraftig til. Derved fremkommer den vifteformede



Fig. 4. Ældre Kimplante af *Arctostaphylos uva ursi*; lidt form.

Forgrening, der er saa karakteristisk for *Arctostaphylos* (smlgn. Fig. 5). Denne i Forening med den krybende Vækst giver den Karakteren af Espalierbusk. Raunkiær (33) regner den til de „aktive Jordfladeplanter“; Warming til de egentlige Krypplanter (49).

Den særlig kraftige Udvikling af den unge Plantes Hovedskud eller af et af dens Sideskud vil ofte fremkalde en stærkt ensidig Vækst, som sikkert i mange, vel de fleste, Tilfælde er betinget af Pladsforholdene paa Stedet; dér, hvor den omgivende Plantevækst er mest aaben, vil *Arctostaphylos* let kunne bane sig Vej med sine Skud. Men i den af kraftig og tæt *Calluna* lukkede Hede vil den

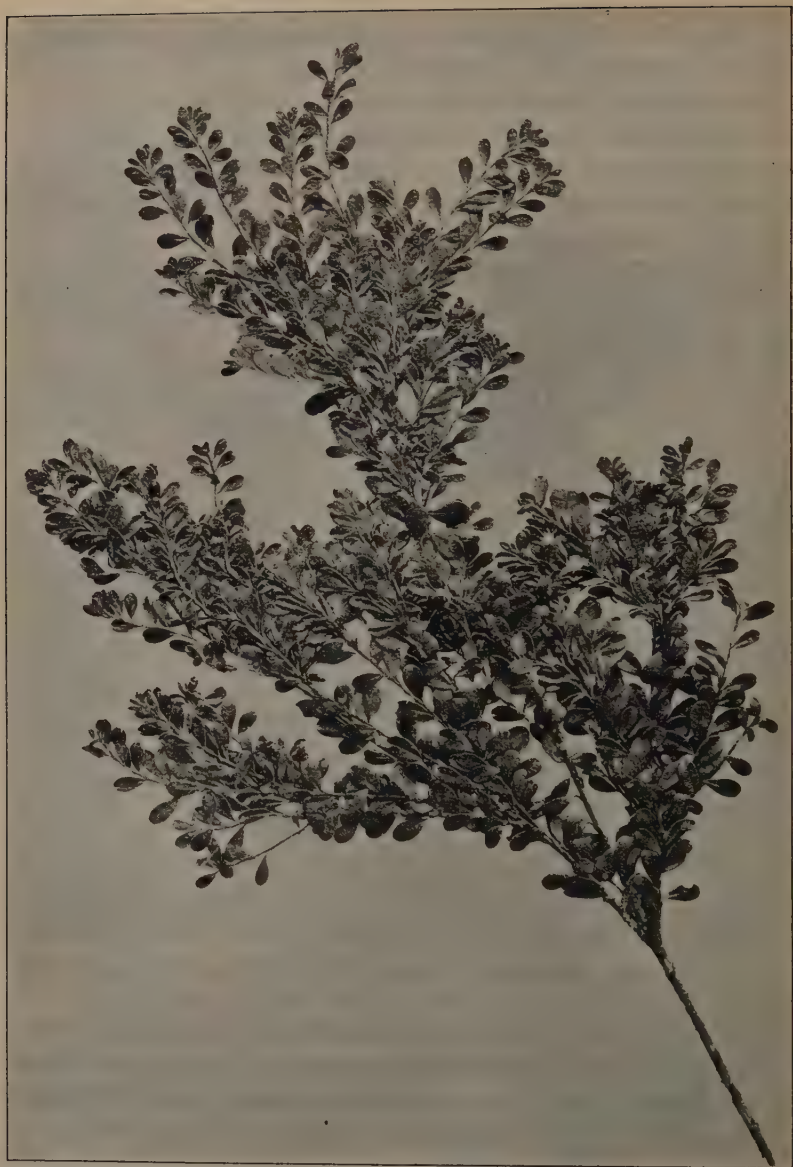


Fig. 5. Grensystem af *Arctostaphylos uva ursi*. Ca. $\frac{1}{2}$.

have mindre Chance for at brede sig; og Evnen til en mere opret Vækst (som hos *Empetrum*) ejer den ikke.

Hvor Pladsen derimod er fri, vil *Arctostaphylos* vokse alsidig

henover Jorden, idet Sideskuddene hurtig naar samme Dimensioner som Hovedskuddet. Med Hovedstammens Ombøjningssted som Midtpunkt straalder de talrige Grene ud til alle Sider. Og Mellemrummene mellem ældre Planters Grenssystemer udfyldes af andre Planter, ofte af Likener, især *Cladonia rangiferina*; Melbærrisets tætte og smukt mørkegrønne Løvmasse danner en ejendommelig Kontrast til Lavernes graa eller brune Toner. Ogsaa andre Arter, Kryptogamer saavel som Fanerogamer, kan godt forliges med *Arctostaphylus*' Vækst, saa at sige vokse i dens Favntag; dette gælder *Vaccinium vitis idaea* og især *Empetrum*, der i Voksemaade har saa megen Lighed med Melbærriset.

Warming (44) siger meget træffende om *Arctostaphylus*: „Tuen har en centrifugal Væxt, omtrent som en Liken, hvis Thallus voxer i sin Periferi, medens Centrum dør bort.“ Paa Steder, hvor en Hedebrand har afsvedet Vegetationsdækket, saaledes at de tykkere og mere modstandsdygtige Grene er blevne tilbage, ses tydeligst den straaleformede Forgrening henover Jordfladen.

Ofte antager de enkelte Individer betydelige Dimensioner. Som Eksempel kan anføres, at et enkelt Forgreningssystem af et Individ paa Hesselvig Hede maalte mere end 2,50 M. i Længde fra Plantens Midtpunkt til Grensystemets Spids, medens andre Systemer, der udgik i alle Retninger, havde en lignende, om end lidt ringere Længde; Diameteren af den Flade, Planten dækkede, var gennemsnitlig mindst 4 M.; Hovedstammen maalte ved Grunden 2 Cm. i Tværmaal. Det er dog ret sjældent at finde Individer af saa stort et Omfang. Graebner (10) nævner, at et Eksempel formaar at dække en kredsrund Plet af flere (3 til 4) M. i Gennemsnit.

Ved at følge et enkelt større Grenssystem fra dets Spids mod dets Grund, vil man oftest se, at den Forbindelse med en Hovedstamme, man paa Forhaand formodede maatte findes, ikke længere eksisterer, og at den bageste Del af Systemets Stamme selv gaar i Forraadnelse. Det hele System er en naturlig Aflægger. Denne Aflæggerdannelse, som Warming har iagttaget og omtalt (44, S. 46), spiller utvivlsomt en stor Rolle for *Arctostaphylus*' Formering og Udbredelse; den bliver derved vandrende, om end langsomt vandrende. I Forbindelse hermed kan det nævnes, at man ikke saa sjælden ved Gravning i Lyngskjolden støder paa gamle, tykke og nu døde Stammer et Par Cm. nede i Skjolden, hvor de har bevaret deres Form saa godt, fordi de er overdækkede af de

humøse Rester. Stammer, der maaler 3—4 Cm. i Tværmaal, har jeg fundet begravne i Overfladen af Heden paa Ulsted Rimmer.

Foruden de lange, vegetative Skud, der især er Grundlaget for de langt krybende Grensystemer, fremkommer der, tildels som Adventivskud fra de ældre Dele af Stammerne, en stor Mængde korte og mere eller mindre skraat opad rettede Skud, der i høj Grad bidrager til Tætheden af den espalermæssigt voksende Busk; de opstaar naturligvis særlig paa Punkter af Stammerne, hvor Pladsen er den gunstigste i alle Forhold.

Normalt dannes aarligt kun ét Sæt Skud, dels vegetative, dels florale. Men enkelte Gange har jeg fundet en rig Dannelse af Skud, der snarest kan betegnes som Høst-Skud, fordi de fremkommer i Løbet af Efteraaret og saa sent som ind i Oktober Maaned. Det er dels Endeknopper, dels Sideknopper, der vokser ud til Høstskud i samme Aar, som Moderskuddet er dannet. Og ikke alene er disse Skud vegetative, men ogsaa florale; man faar altsaa det Særsyn, at der i samme Aar fremkommer to Sæt florale Skud, begge endelig udviklede i det følgende Aar (se nedenfor). Hvad der betinger denne Dannelse af Høstskud, er vanskeligt at udrede, men det synes, som om den kun finder Sted, hvor *Arctostaphylus* vokser i Udkanterne af Heden, saaledes især langs Veje, med Plads til at brede sig, med rigelig Adgang af Lys og muligvis andre gunstige Betingelser for Velvære. Lignende Skud er paa samme og andre Lokalteter iagttagne hos *Vaccinium vitis idaea*, men i meget mindre Grad udviklede.

Ret almindelig finder man Skudspidserne af *Arctostaphylus* deformerede ved Angreb af en *Phytoptus* (se S. Rostrup, Vidensk. Medd., 1896).

Hvor Heden slaaes eller tyndt skrælles, kan *Arctostaphylus* nok til en Begyndelse have god Lejlighed til at brede sig paa Lyngens Bekostning. Dog kan en gentagne Gange fortsat eller dyb Skrælning sætte den stærkt tilbage, medens *Calluna*, tildels ved sin meget rigelige Frøformering, holder Stand. Jeg er tilbøjelig til at tro, at denne idelige og i saa mange Henseender skadelige Skrælning af Lyngskorpen i Hederne, der ogsaa er skæbnsvanger for *Vaccinium vitis idaea*, i meget højere Grad end Brande bidrager til at mindske Tallet af *Arctostaphylus* o. a. af Hedens karakteristiske Buske og til at gøre Heden endnu mere ensformig. Thi efter Brande restituerer *Arctostaphylus* sig forholdsvis hurtig og energisk; det beror naturligvis i høj Grad paa, hvor dybt Branden har grebet

ind i Hedeplanternes Livsvirksomhed. Efter hvad jeg mangfoldige Gange har haft Lejlighed til at se paa de af Branden ganske sort svedne Heder, hvor al levende Plantevækst foreløbig er totalt hæmmet, dannes der nye Skud i stort Antal fra de mere eller mindre afsvedne og delvis brændte Stammer, i hvilke alt Liv paa Forhaand skulde synes udsukt. Skuddene fremkommer for det meste paa den mod Jorden vendte Side af Stammerne eller fra Flankerne; de lægger sig straks fladt henover Jorden, straalende til alle Sider. Ofte har saadanne Rosetter af Skud en skuffende Lighed med Kimplanter, en Omstændighed, der muligvis har forledt A. Meier (23, S. 516) til at sige, at *Arctostaphylus* indfinder sig „besonders gern“ efter Brande. Den modstaar dem derimod godt, ihvorvel E. Warming (45, S. 57) naturligvis har nogen Ret i, at Brande kan sætte den tilbage. —

I hvilken Alder *Arctostaphylus* begynder at blomstre, har jeg paa Grund af unge Planter Sjældenhed aldrig haft Lejlighed til at følge nøje, men det synes, som om Blomstringen først indtræder i en forholdsvis fremrykket Alder. Florale Skud fremkommer paa ældre Planter i de øverste Bladhjørner af de lange, krybende Skud eller (monopodialt) i Spidsen af de korte Skud fra Stammen. De florale Skud kan bære det samme Antal Løvblade som vegetative; der findes



Fig. 6. *Arctostaphylus uva ursi*, Juli. Foroven den nikkende Blomsterstand for det følgende Aar. $\frac{1}{1}$.

altsaa hos *Arctostaphylus* ingen udpræget Arbejdsdeling mellem vegetative og florale Skud. Disse er aabenbart lidt anderledes stemte overfor Tyngden, idet de er højede skraat opad, bort fra Jordoverfladen, i deres største Længde; kun den yderste Del af Skuddet, den egentlige Blomsterstand, er bøjet, nikkende, en Stilling, som bevares gennem første Aar saavel som under Blomstringen. Blomsterstanden anlægges nemlig meget tidlig; allerede i Juli Maaned er den Stand, der skal blomstre i det følgende Aar, ret vidt fremskreden (Fig. 6) og i hvert Fald iøjnefaldende nok, hvilket er iagttaget og omtalt af E. Warming for grønlandske Forholds Vedkommende (47, S. 39). Den unge Blomsterstand er medio Oktober 3—4 Millim. lang; dens Akse er krummet saa stærkt i Forhold til den øvrige Del af det florale Skuds Akse, at den er ganske parallel

dermed. Blomsterstandene er mere eller mindre godt skjulte af Plantens Løvværk, hvilket maaske i den lange Periode inden Blomstringen kan forøge den Beskyttelse, som de lidet omfangsrige Dækblade giver. Nye vegetative Skud fortsætter Forgreningen af de florale Skud fra et af de øverste Bladhjørner. —

Anatomien af Stænglen hos *Arctostaphylus uva ursi* er delvis omtalt af P. Segerstedt (37), hvis Undersøgelse i det væsentlige stemmer overens med, hvad her skal anføres. Den endnu urteagtige Stængel, hvis Tværnsnit er ganske cirkelrunt, er beklædt med temmelig lange, fine Dækhaar, som imidlertid tidlig fældes, saa at kun de afbrudte Basaldele sidder tilbage i Høsten. Overhuden har stærkt fortykkede og kutiniserede Ydervægge, og Kutiniseringen strækker sig, ligesom hos *Genista pilosa* (24, S. 171), ned langs Sidevæggene og med Udløbere ind under Indervæggene (Fig. 7).

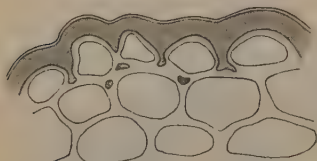


Fig. 7. Brudstykke af Stænglens Bark. De kutiniserede Lag er graat tonede. Ca. 260:1.

Spalteaabninger mangler. Den primære Bark bestaar yderst af ca. 3 Lag Celler, der er ret tykvæggede, kollenkymatiske og uden eller med meget smaa Intercellularrum; derindenfor træffes flere Lag Celler, ligeledes afrundede, men større og mindre tykvæggede; den inderste Del af Barken er ikke skarpt sondret fra Central-

cylindrens yderste. Barken er, som af Segerstedt fremhævet, mindre assimilerende end beskyttende; den er, i alt Fald om Efteraaret og Vinteren, rig paa Garvestoffer. Karrene er meget snævre, kun 0,01—0,015 Mm. vide. Marvstraalerne er enlagde, og den homogene Marv bestaar af tykvæggede og porøse Celler.

I det tredje Aar finder der, i alt Fald paa den nederste Del af Skuddene, en meget livlig Korkdannelse Sted, efter at Barkcellerne allerede tidligere er begyndt at skilles fra hverandre, og efter at der hist og her er fremkommet lokale Forkorkninger i de yderste Barklag, antagelig paa Steder, hvor den yderste Bark og Overhuden af en eller anden Grund er bristet. Den egentlige Korkdannelse foregaar fra Pericyklen; undertiden ses dog de ydre lokale Korkpartier forbundne med de indre ved Korklag, der gaar paa skraa gennem Barken. I Forhold til Centralcylindren er Korken paa de unge Stængler ret omfangsrig.

En 6—7-aarig Gren bærer yderst Kork; den primære Bark er fældet, og kun Rester deraf hænger endnu ved Korkens Overflade.

En meget rigelig Mængde Garvestoffer farver Korken brun. Paa alle ældre, især naturligvis paa gamle Stammer, dannes Korken af talrige, papirtynde og tæt liggende Lag, der er spaltede paa langs og saa godt som fuldstændig løsnede indbyrdes; de fældes som lange, hvælvede (svagt tagrendeformede) Flader, men vil forøvrigt vanskeligt kunne fældes, da Stammerne er krybende, og som ovenfor nævnt, let tildækkes af henfaldende Plantedele. Indenfor Barkens mange Lag træffes ved Udgangen af hver Vækstperiode en ny sekundær Bark, bestaaende af ca. 15 Cellelag; den rent overvejende Del heraf er Korkvæv, hvis yderste Cellelag er skilt fra det en Aargang ældre Lag af sekundær Bark ved Opløsning af de radiale Vægge; dets Ydervægge er udad hvælvede.

I ældre Ved er Karrene en Del større end i de første Aar; i i radial Retning er de 0,045—0,07 Mm., i tangential Retning 0,038 Mm. vide; ofte ligger de to eller tre sammen. Om andre Enkeltheder i Vedbygningen findes Oplysninger hos O. G. Petersen (31). — Om Aarringene se nedenfor.

Paa vore af adskillige Indgreb stærkt forstyrrede Heder er det forholdsvis sjældent at finde Materiale til Bestemmelse af den maksimale Alder af *Arctostaphylus uva ursi*. Dertil kommer, at det selv paa forholdsvis urørte Heder ikke er almindeligt at træffe paa store og sammenhængende Individuer af en anselig Alder, da *Arctostaphylus*, som ovenfor nævnt, er tilbøjelig til Vandring ved Opløsning af Forbindelsen mellem Hovedstamme og Skudsystemerne derfra. Skønt mit Materiale af Stammer af en mere anselig Alder fra danske Heder af ovennævnte Grunde kun er ringe og ingen Oplysning giver om den maksimale Alder, skal jeg dog anføre nogle Eksempler fra Hedeegne, som aabenbart i lange Tider har været i Ro.

	Alder	Største Radius (opad)	Mindste Radius (nedad)	Aarringsvidde
Ulsted Rimmer Nr. 1.	x + 60 Aar	16 Mm.	— Mm.	fra 0,4 — 0,15 Mm.
— — — 2.	x + 60 —	12 —	5 —	- 0,55—0,1 —
— — — 3.	Ca. 25 —	5 —	2 —	- 0,4 — 0,1 —
Hesselvig Hede. 1.	27 —	5 —	2,5 —	- 0,3 — 0,1 —
— — — 2.	Ca. 45 —	8 —	5 —	- 0,6 — 0,07 —
Hede Øst for Tim. .	Ca. 28 —	6,5 —	3 —	- 0,4 — 0,15 —

Alderen er vanskelig at bestemme, dels fordi Dele af Veddet er mere eller mindre under Opløsning, dels fordi Grænsen mellem Aarringene i den senere dannede Del af Stammen er utydelig. De

krybende Stammers Dorsiventralitet aabenbarer sig i de anførte Tilfælde ved, at Tilvæksten er ulige, størst mod Oversiden (Stammerne er epinastiske); sammenlign ogsaa Rosenthal (35). Aarringenes Vidde varierer i ikke ringe Grad; størst og tydeligst afgrænsede er de i den ældre Del af Stammerne. Den største fundne Vidde af Karrene i disse ældre Stammer er 0,05 Mm.

Ved Sammenligning med Kihlman's Maalinger fra Russisk Lapland (18, S. 231), vil man finde, at Vidden af Aarringene (og dermed Radius) gennemgaaende er en Del større i Danmark end paa Kola-Halvøen. Det samme er, i Følge Rosenthal (35), Tilfældet i Alperregionen.

Bladenes Form, der i Danmark ikke synes mig at være meget varierende, og deres læderagtige Konsistens er vel kendt. Deres Orientering i Forhold til Lyset er lidt forskellig efter Alderen. Efter Løvspringet er de nogen Tid sammensluttede, opad rettede og stillede med en spids Vinkel i Forhold til hverandre; derefter bøjer de sig mere ud. Paa de krybende Skud er Bladene — i Overensstemmelse med Skuddenes Tendens til Dorsiventralitet — ensidig vendte, i det alle Bladpladers Overside ved Drejninger af de korte Stilke orienteres saaledes, at Lyset falder lodret paa den, og, bortset fra Bladpladernes sædvanlige svage Krumning paa langs, staar de altsaa nogenlunde horisontalt. Bladene er i Skuddenes 3dje Vækstperiode for Størstedelen fældede.

De i Efteraaret 1—2 Mm. lange, vegetative Knopper er lukkede, og Bladanlæggene er vel beskyttede af talrige Knopskæl, der er fast sluttede om hverandre. Løvspringet sker i Slutningen af Maj eller først i Juni Maaned — altsaa efter Blomstringen.

Bladene er nærmest dorsiventralt byggede. Overhudens Yder-vægge er paa Oversiden stærkt fortykkede og kutiniserede, paa Undersiden mindre svære. Kun langs Randen findes lange Dækhaar; ellers er Pladen glat og blank. Spalteaabningerne, der alene forekommer paa Bladets Underside, har en ret ejendommelig Bygning, der minder om den, man finder hos *Rhododendron*; se forøvrigt Fig. 8. Palissadevævet bestaar af 4—6 Rækker temmelig korte Palissader; jeg har aldrig fundet et saa ringe Tal som det af Henning E. Petersen (30, S. 114) angivne, der sikkert ikke er normalt. Ovenover og især nedenfor Karstrængene findes mekanisk Væv af større og mindre Kollenkymceller, der naturligvis er mest udviklede under den midterste Karstræng; iøvrigt har Bladet som

bekendt ingen fremspringende Nerver. Saavel hos Schröter som hos Henning E. Petersen findes Figurer af Bladets Bygning.

I Løbet af Oktober antager Bladene, i alt Fald de for Lyset mest udsatte, en lysere eller mørkere rød Tone, undertiden bliver de helt rødbrune; de dækkede Blade holder sig grønne, endog hele Vinteren. Den røde Tone, der skyldes en periodisk Optræden af Anthocyan i Grønvævet, holder sig langt ind i Foraaret, dog ikke saa længe som hos *Calluna*.

Forskellen mellem Bladene fra sidste og foregaaende Vækstperiode synes at være indskrænket til en Forøgelse af Tykkelsen af Overhudens Ydervægge og en svag Strækning af Palissadecellerne; gennemgaaende er foregaaende Aars Blade nok saa mørke som den sidste Vækstperiodes.



Fig. 8. Spalteaabning fra Undersiden af Bladet af *Arctostaphylos uva ursi*. Til venstre i Tversnit; til højre set ovenfra. Ca. 260:1.

Omkring Midten af Maj blomstrer *Arctostaphylos uva ursi* paa vore Heder, tidligst paa sydlig eksponerede Voksepladser og rigeligst, hvor den har god Lejlighed til at brede sig ud over frie Flader, langs Grøfter, Veje o. s. v.

Bestøvningen sker, saa vidt jeg har set, ved Insekters Hjælp, og Fremmedbestøvning synes fremherskende; m. H. t. Blomsterbiologien henvises til den indgaaende Omtale hos E. Warming (47, S. 39), der giver instruktive Afbildninger af Enkelthederne i Blomsterbygningen, og anfører den herhen hørende Litteratur. Ogsaa C. Schröter (36, S. 152) omtaler ret udførlig Blomsterbiologien (det kan dog bemærkes, at hans Fig. 52,1 giver en ganske fejl-agtig Forestilling om Blomsternes Orientering).

Af Klasens 5—6 Blomster kommer kun 2—3 i Frugt, de nederste. Frugterne holder sig friskt røde Vinteren over, men er naturligvis endnu tørrere end i Dannelsesaaret.

Om Spiringsforholdene har jeg intet at meddele. Sjældenheden af Kimplanter kunde tyde paa, at Spiringsenergien er ringe. Skønt det maaske kunde antages, at Kimplanterne vilde have en Chance

for at komme frem paa aabne Flader i Heden, saa finder man dog yderst sjældent saadanne paa den „nye Jord“, der fremkommer ved Grusgravning eller lignende Arbejder, og hvor *Calluna*, *Empetrum* eller *Sarothamnus scoparius* kan findes i stor Mængde. I det hele maa det vistnok siges, at den vegetative Formeringsmaade er overvejende. Den sene Indvandring af *Arctostaphylus* paa alluvial Sandbund¹⁾ i Jylland maa kunne sættes i Forbindelse med denne Antagelse.

Vaccinium vitis idaea.

Med det betydelige Vokseomraade, *Vaccinium vitis idaea* har, er den dog, ligesom *Arctostaphylus uva ursi*, udpræget nordisk-alpin. C. Schröter, som har samlet Oplysningerne om dens geografiske Udbredelse (36), nævner, at den i Mellemeuropa viser tydelig Tilslutning til Skovfyrrer m. H. t. Udbredelsen, men at den paa alle Punkter gaar udover dennes Grænse. Dette gælder de store Heder i Nordvest-Tyskland (jvfr. Graebner), og det gælder som bekendt ogsaa Danmarks Heder.

Vaccinium vitis idaea mangler næppe i Egne af vort Land, hvor naturlige Humusarealer af en vis Tørhed har videre Udbredelse. Den hører til Hedernes mest karakteristiske Planter, indfinder sig paa Moser, hvis Overflade er tilstrækkelig udtørret, og danner en ejendommelig Bestanddel af Bundvegetationen i lyse Skove (af Skov-Fyr, Eg og Birk). Det er hermed givet, at den navnlig er udbredt paa den jyske Halvø, paa Bornholm og i Nordsjælland.

I meget højere Grad end de to andre danske *Vaccinium*-Arter er *V. vitis idaea* Hedeplante. Baade paa bakkede Heder og Hede-flader er den yderst almindelig, naturligvis stærkt vekslende efter Voksepladsens Beskaffenhed og den Udvikling, dens Konkurrenter, især *Calluna*, har naaet.

Hvad for det første Voksepladsen angaar, kan de Fordringer, *V. vitis idaea* stiller for sin Trivsel, nogenlunde let erkendes paa Grundlag af Iagttagelser af dens Optræden i Naturen. Om den er kalkflyende, saaledes at den ikke taaler større Mængder Kalk i Jordbunden, har jeg ikke ved Iagttagelse kunnet afgøre, men den

¹⁾ Hverken *Arctostaphylus* eller *Vaccinium vitis idaea* gaar ind under den Regel, som S. Birger (3), støttet paa forskellige Eksempler, anfører: overalt, hvor Planterne indfinder sig paa ny Jord, er de med Bær forsynede Arter forholdsvis rigelig repræsenterede.

er sandsynligvis kalkflyende; under alle Omstændigheder er den, paa Grund af sin hele Voksemaade, absolut uskikket til at leve paa Overfladen af fast Kalkgrund (saa lidt som af andre Stenarter). Den kræver udpræget humøse Aflejringer eller i det mindste en humusblandet Jordbund; uden en saadan vinder den ikke ret Indpas. Den foretrækker endvidere en vis Løshed i det humøse Jordsmon, hvilket fremgaar af dens ypperlige Udvikling paa den tørre og løst smuldrende Tørv i Overfladen af stærkt afvandede Lyngmoser, paa Skrænter med vekslende Hede og Skov eller i det bløde Mosdække paa Bunden af Fyrreskove (se nedenfor).

I Heden træffes *Vaccinium vitis idaea* saa vel paa de tørreste Lokaliteter som paa fugtigere, men den hører dog i langt højere Grad hjemme i Calluna-Heden end i Erica-Heden; den taaler bedre Hedebakkernes Tørhed end den fugtige Hedes mere eller mindre stagnerende Vand, og den gaar, saa vidt jeg har set, aldrig ud i Hedekærene (Grimmia-Kær o. lign.). I Moser forekommer den, som allerede nævnt, kun paa Steder, hvor Overfladen er i tilstrækkelig Grad udtørret, i alt Fald til en vis Tid af Aaret.

Som bekendt stiller *V. vitis idaea* saa moderate Krav til Lysforholdene, at den befinder sig fortræffeligt paa lyse Skoves Bund, hvorom nedenfor, medens den paa den anden Side i saa ringe Grad er Skyggeplante, at den trives vel ude i den ganske aabne Hedes Lys. Den synes desuden ikke, som den meget mere følsomme *Vaccinium myrtillus*, at være afhængig af Ekspositionen paa den aabne, bakkede Hede; ti den trives med samme vegetative Frodighed paa sydlig som paa nordlig eksponerede Hælder.

I Konkurrencen med Hedens øvrige Planter har *V. vitis idaea* gode Betingelser for at bevare sin engang erobrede Plads og brede sig over nyt Terræn. En høj og tæt Calluna-Vegetation vil dog svække eller udelukke den, medens et lavt og aabent Lyngdække ikke hindrer dens Lysskud i at komme frem. Ogsaa forliges den godt med de karakteristiske Vegetationer af *Arctostaphylus*, *Empetrum* og Likéner; frem af det tætte Plantedække stikker Tyttebærrets Lysskud ofte i stor Mængde. Det ses dog undertiden, at *Cladonia rangiferina*, hvor den forekommer i særlig mægtige Bevoksninger, aabenbart bereder *V. vitis idaea* Vanskeligheder og endog ganske kvæler den. Derimod drager den i høj Grad Fordel af et anseligt Mosdække; paa mosrige Heder forholder den sig næsten som i den mosrige Skovbund, hvor den opnaar sin største vegetative Frodighed.

Ligesom *V. vitis idaea* synes helt at undgaa Sandfladerne i Hedernes Indsande — man ser den stedse vokse ud til Randene af Indsandene, ikke ind paa Fladerne — saaledes mangler den, efter min Erfaring, ogsaa i Klithederne, særlig i den vestlige Del af Jylland, og den vil vistnok indvandre meget langsomt over disse Arealer, hvor Humusdannelsen endnu er svag og foregaar med yderst ringe Hastighed. Paa Klitsletter eller alluviale Heder, som ved Tilplantning med Skov-Fyr helt har ændret Karakter, har *V. vitis idaea* dog bedre kunnet indfinde sig. Herpaa tyder i alt Fald Forholdene i den nordligste Del af Hornbæk Plantage (lige Syd for Hornbæk By), hvor der findes en mere end hundredaarig Fyrre-Bevoksning. *V. vitis idaea* danner her i Forening med *Hylocomium parietinum* og *H. proliferum* et 8—10 Cm. mægtigt Dække af levende og døde Planter, der hviler paa Sand, og i hvis nederste Lag findes tydelige Rester af *Carex arenaria*. Iøvrigt ses *Calluna*, *Empetrum*, *Polypodium vulgare* og enkelte andre Fanerogamer og Kryptogamer, men alle i ringe Antal i Forhold til de 3 nævnte Planter. Naturligvis er det langsomt formulende Mos, Blade og Stængler af *V. vitis idaea* m. m. sammenspundet af et rigt Svampemycelium. Dette fuldstændig tørveagtige Humuslag, Tyttebærtørven, gennemkrydses af Rizomerne af *V. vitis idaea*, som her i dette tykke Mostæppe har naaet en ypperlig, vegetativ Udvikling.

Paa samme karakteristiske Maade optræder *V. vitis idaea* i andre Fyrreskove, saaledes i Silkeborg Nordskov nedenfor Ulvehoved og umiddelbart Nord for Jærnbanelinjen Silkeborg—Skanderborg. Her træffer man rene Plantninger af *Picea excelsa* Side om Side med Bevoksninger af *Pinus silvestris*; hvor disse grænser op til hinanden efter lige Linje, træder Skovbundens forskellige Karakter indenfor de to Bevoksningsarter overordentlig slaaende frem. Medens i Granskoven det sædvanlige enstonige Mostæppe af især *Hylocomium proliferum* og *H. parietinum* er saa godt som ganske eneraadende, og al Underskov er udelukket, saa er Mos-Bunden i Fyrreskoven okkuperet af en rig Vegetation af Dværgbuske: *Vaccinium vitis idaea*, *V. myrtillus*, *Calluna* og *Empetrum*, og Underskov af Gran, Bøg, Eg, Ene- og Tørstetræ bryder frem mellem Fyrrens Stammer. Mosdækket i Fyrreskoven er sammensat af de samme Arter som i Granskoven, dertil *Hylocomium triquetrum* og *Dicranum scoparium* samt muligvis andre, som dog er uden Betydning; det er i Forening med det underliggende Morlag (Grænsen mellem Mos- og Morlag er selvfølgelig ikke skarp) ca. 10 Cm. mægtigt. Blandt Dværg-

buskene er nu *Vaccinium vitis idaea* i ganske særlig Grad fremtrædende, beherskende store Partier af Bunden med sit vakre, mørkegrønne Løv. Mindre lyskrævende end *Calluna* har den her ganske Magten over denne, der er ret tilbagetrængt.

Det er af Interesse at betragte *V. vitis idaea*'s Optræden i Fyrreskovene i Nutiden, fordi vi derved, selv i de i Danmark fremelskede Fyrreskove, faar et Indtryk af, hvorledes Skovbunden i tidligere Tiders Fyrreskove har taget sig ud, og fordi man derigennem forstaar den ovenfor citerede Udtalelse af C. Schröter, at *V. vitis idaea* i sin Udbredelse er nøje knyttet til Skov-Fyrren. Men dens Grænser strækker sig dog langt udover Fyrrens. Ogsaa i vore Løvskove træffes *V. vitis idaea*, især naturligvis i de lyse Skove af Eg eller Birk, medens den i Bøgeskoven kun vokser i Lysninger eller langs Veje (t. Eks. i Grib Skov i Nord-Sjælland). Kun i jyske Skove og Krat af Eg har jeg fundet den i større Mængde; her kan den fremkalde en meget kraftig Mordannelse, saaledes i Hald Egeskov paa den sydlige Side af det kratagtige Parti. I Birkeskove maa den mange Steder kæmpe en alvorligere Kamp med *Calluna* end i Fyrreskoven og Egeskoven, fordi *Calluna* her paa Grund af det rigeligere Lys er meget mere talrig og livskraftig end indenfor de to andre Skovformer.

M. H. t. Tiden for Tyttebærrets Indvandring til vort Land vil det ligge nær at antage, at den er sket i Fyrretiden, da saa mange andre Plantearter er naaede hertil (jvfr. Gunnar Andersson, 2); imidlertid tyder Blytt's og Holmboe's Paavisning af den fra Birkeazonen (13) paa, at Indvandringen er sket endnu tidligere, og E. Warming regner den (ligesom *Vaccinium uliginosum*) ifølge Analogier til Tundramarkens Planter, der indvandrede paa den af Isen forladte Jordbund (46); Fund fra Danmark af *Vaccinium vitis idaea* mangler dog endnu. —

Da jeg aldrig trods mangeaarig og grundig Eftersøgning har fundet Kimplanter eller unge Planter, og gentagne Spiringsforsøg ikke er faldne gunstig ud, kan jeg intet meddele om det primære Rodsystem. N. Sylvé (38) omtaler kun en enkelt ung Plante; han bemærker, at Hovedroden synes at være længe levende (?). Det sekundære Rodsystem bestaar af Birødder, der fremkommer i Hjørnerne af Udløbernes Skælblade, $\frac{1}{2}$ —1 Mm. ovenfor Akselknoppen, en Afstand, der ved Anlægget synes bestemt af den Plads, som selve Roden og Akselskuddet med Tiden vil kunne kræve. Rødderne er længere og kraftigere og tillige som Regel mindre stærkt

forgrenede i Bladhjørner, hvor der foruden Roden udgaar en Udløber, medens de, hvor denne mangler, er svagere, ofte korte og traadfine samt rigere forgrenede. Ogsaa fra Lysskuddets nederste Del udgaar saadanne Rødder, ofte i Mængde.

Mykorrhizer og Mangel paa Rodhaar er hos *V. vitis idaea* konstaterede af Thomas (42) og A. B. Frank (9); ingen af dem beskriver dem dog nøjere. Senere er Mykorrhizerne nævnte af Höveler (15), hos hvem man ogsaa forgæves søger nærmere Besked, og hos Ch. Ternetz (41), der beskriver en Mykorrhizadannende Svamp (*Phoma radidis Vaccinii*) paa Rødderne af *V. vitis idaea*, men ikke giver nærmere Oplysninger om Maaden, hvorpaa den forekommer. Og senest har Henning E. Petersen (30, S. 123) givet den meget lakoniske, men interessante Meddelelse, at han paa Materiale fra Hovmose i Gadevang ved Frederiksborg har fundet baade endotrofe og ektotrofe Mykorrhizer. Jeg har gentagne Gange undersøgt Rødderne af *V. vitis idaea*, og skønt jeg langtfra er kommen til noget tilfredsstillende Resultat med Undersøgelsen af dette vanskelige Objekt, saa maa jeg dog anføre, hvad jeg har set. Korallformede Mykorrhizer, som hos *Arctostaphylus uva ursi*, findes ikke. Derimod har jeg fundet, at Rødderne ganske mangler Rodhaar (ogsaa angivet af Höveler), at mange fine Rødder, særlig af dem, der udgaar fra Lysskuddenes nedre Partier ind i et endnu levende Mosdække, er svampefri, men at Flertallet af Rødderne dog er i nøje Forbindelse med Svampemycelier. Man finder svampeklædte Rødder, hos hvilke Myceliernes Traade løber langs ned ad Rødderne omtrent helt ud til deres Spids og snoende sig om Rødderne paa ofte besynderlige Maader; disse Traade er brunlige og har ganske korte Sidegrene, som, saa vidt jeg kan se, trænger ind gennem Overhudscellernes Vægge. Og endelig finder man mere normale Svamperødder med en tydelig og forholdsvis tyk Hætte omkring Rodspidsen, dannet af overordentlig tynde Mycelietraade uden Spor af brunlig Tone; ovenfor Rodspidsen med dens Hætte optræder saa de brune, paa langs gaaende Mycelietraade, som ovenfor er omtalte. Mykorrhizerne hos *V. vitis idaea* o. a. Vakinier kan trænge til en særlig Undersøgelse. — Forøvrigt frembyder Rodens Anatomi intet af Interesse.

Om den første Forgrening hos *V. vitis idaea*, Primskuddets Skæbne, Tiden for Udløbernes Fremkomst o. s. v. kan jeg intet meddele; hos den af N. Sylvén (38) omtalte Plante optræder Udløbere i det 3. Aar.

De vidt om vandrende Udløbere, der med uregelmæssige Mellemrum sender Lysskud op over Jorden, er i den forreste Del ligesom opsvulmede og ganske lyse af Farve, hvide eller svagt rødlig. Bagtil bliver de, ofte ret pludselig og faa Cm. fra Spidsen, dels noget sammenskrumpne, dels lyst brunligt farvede. De udgaar uden bestemt Orden, men er talrigst i Plantens forreste Del. Længden er noget forskellig, alt efter Voksepladsens Beskaffenhed; i løs og blød Humus bliver de længst, kvarterlange eller deromkring. Spidsen er afrundet og fast. I Heder med en kraftig og (i alt Fald længe) urørt Lyngskjold holder Udløberne sig altid til Skjolden, men til den nederste Del deraf, ret nær det underliggende, humusfarvede Sand. Forringes Skjolden i Tykkelse, t. Eks. ved Skrælning, forandres dermed den Dybde, hvori Udløberne forløber, og dette har da en ret gennemgribende Indflydelse paa hele Plantens Habitus (se herom senere). — Unge Udløbere fremkommer enten paa ældre eller paa Lysskuddenes under Jorden værende Del. Skælbladene er smaa, hindeagtige og yderst hurtig forgængelige.

I den forreste, yngste og lyst farvede Del af Udløberen er Barken et ret mægtigt Væv af tyndvæggede og afrundede Celler med Inter-cellularrum; det er denne Bark, der giver Udløberen dens „kødede“ Præg. Medens Overhuden i Udløberens forreste Del er tyndvægget baade udadtil og indadtil, bliver dens Cellevægge bagtil noget fortykkede, mest de inderste (tangential) Vægge (se Fig. 9). Mellem Overhud og Bark findes en 1-laget Hypoderm. En sluttet Ring af mekanisk Væv udvikles omkring Centralcyldren, men er sikkert som Regel kun svag og uden synderlig Betydning. Veddelen er meget mindre fremtrædende end i Lysskuddet, Karrene gennemgaaende lidt videre (ca. 0,017 Mm.), men Marven er større, dens Vægge porøse. Efterhaanden skrumper den omfangsrige Bark ind — i meget forskellig Afstand fra Udløberens Spids. Den ældre, brune og faste Jordstængel bærer yderst Kork og derindenfor den øvrige sekundære Bark. I Veddet, der nu er vel udviklet, er de største Kar 0,025 Mm. vide. Marven er i det mindste fra Eftersommeren ganske fyldt med Stivelse.

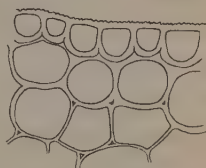


Fig. 9. Epidermis og Hypodermis af Udløberen hos *V. vitis idaea*. Ca. 200:1.

Lysskuddene udgaar, som nævnt, fra Udløberne; sjældnere er de dannede af selve Udløbernes opad bøjede Spids. Deres største

Højde opnaar de paa mosrig Skovbund, 20—30 Cm., regnet fra det Punkt, hvor Biroddannelsen paa den af Jord eller Mos tildækkede Del begynder. Paa Hederne er Lysskuddene dog betydelig lavere: ca. 10 Cm. Under alle Omstændigheder er Højdevæksten og Skuddenes hele Livsvarighed altsaa stærkt begrænset; og i Forhold til de andre *Vaccinium*-Arter opnaar Skuddene kun en meget ringe Tykkelse og Styrke. Deres højeste her i Landet naaede Alder er vistnok 5—6 Aar; paa Hederne dog som Regel kun 3—4 Aar.¹⁾ E. Warming (49, S. 75) benævner denne (og andre) „Udløberbusk“, hvis Stængler efter faa Aars Forløb dør, „rimeligvis i Korrelation med Forekomsten af underjordiske Udløbere, ved Hjælp af hvilke Planterne udbrede sig stærkt.“

Forgreningen er sædvanligvis monopodial, indtil florale Skud fremkommer; derefter sympodial. Naar den af Voksepladsen betingede Højde er naaet, kan der, baade mens de øverste Skud endnu er levende og efter deres Død, fremkomme Foryngelsesskud fra Lysskuddets ældre Stængelled; og disse Skud kan forgrene sig videre paa ganske samme Maade som Hoved-Lysskuddet (Fig. 10), men har dog vistnok oftere en endnu mere begrænset Levetid end selve Hovedskuddet og dets først dannede Døtreskud.

Ligesom hos *Arctostaphylos uva ursi* kan der under gunstige Forhold fremkomme Høstskud, der dog er korte og ret svage; jeg har i flere Aar paa forskellige Lokalteter fundet saadanne Skud.

Forringes Humuslagets, specielt Lyngskjoldens, Tykkelse, t. Eks. ved Skrælning, vil Lysskuddenes Udvikling derved hæmmes i betydelig Grad. Den underjordiske Del deraf bliver næppe mere end 1—2 Cm. lang, og den overjordiske Del 2—3 Cm.; Bladene bliver meget mindre og faar en lysere, næsten gulgrøn Farvetone; Hæmningen skyldes de ændrede Fugtighedsforhold og Ernæringsbetingelser (Fig. 11). Disse hæmmede Former har en paafaldende Lighed med den fra arktiske Egne vel kendte Form *pumilum* Horn. Se saaledes den korte Omtale og Afbildningen, som F. R. Kjellman (19, S. 507) giver denne Dværgform! M. L. Fernald (6) omtaler fra Amerika foruden den almindelige Form en „small-leaved variety“, der vokser „on bare slopes and dry plains,“ hvor „the branches are very short and often prostrate, and the plant forms close mats

¹⁾ Rosenthal (35) angiver fra Alpelokaliteter baade 9 og 14 Aar. Det er jo muligt og endda rimeligt, at Alderen i Alpeegne gennemgaaende bliver større; noget saadant antydes ogsaa af Kanngiesser (17) m. H. t. *Vaccinium myrtillus*.



Fig. 10. Grensystem af *Vaccinium vitis idaea*. Skuddenes Følge angives af Tallene. 3 er et Forængelseskud. Eksemplar fra Skovbund, ca. $\frac{1}{2}$.

rising only 3 or 4 centimeters above the surface of the ground.“ I en lignende Tilstand har jeg ofte fundet *Vaccinium vitis idaea* paa skrællede Hede. Og hvor Heden er gentagne Gange skrællede, kan Planten lide saa stærkt, at den ganske dør bort, idet de vandret gaaende Jordstængler, der, som ovenfor nævnt, befinder sig i de dybeste Lag af Skjolden, blottes eller maaske helt fjernes.

Et meget afvigende Ydre antager *Vaccinium vitis idaea* ogsaa, hvor den lejlighedsvis i Heden vokser i Sand, t. Eks. langs Veje, og dér er bleven udsat for en svag Tilsanding. Lysskuddene forgroves i dette, iøvrigt sjældne, Tilfælde meget stærkere end van-



Fig. 11. *Vaccinium vitis idaea* fra skrællede Hede. $\frac{1}{1}$.

ligt, og Blade saa vel som ogsaa Blomster bliver meget mindre end under normale Forhold i Heden (Fig. 12).

Hvor Hedevegetationen ved Brande er fuldstændig afsveden, vil *Vaccinium vitis idaea*, hvis Jordstængler er vel beskyttede af Lyngskjolden, hurtig restitueres; de brændte Skud er naturligvis dræbte, men fra Jordstænglerne bryder meget snart nye Skud frem, og det viser sig som Regel, at *V. vitis idaea* faar et betydeligt Forspring paa de afsvedne („brændte“) Heder fremfor de fleste andre Hedeplanter, der dog nogenlunde let kommer til Kræfter igen, saasom *Calluna*, *Erica* o. s. v. Alligevel naar *V. vitis idaea* ikke let den Frodighed, den kan have t. Eks. paa lyngklædte Bakker, idet Mosdækket fuldstændig er afbrændt ved almindelige Brande og kun restitueres overordentlig langsomt.

Lysskuddene (Fig. 13) er uden Kanter. De fra sidste Vækstperiode (enaarige Skud) er forsynede med temmelig lange, vortede og tæt siddende Haar.¹⁾ Overhuden har stærkt fortykkede Ydervægge (i højere Grad end hos *V. myrtillus* og *V. uliginosum*) og en vel udviklet Kutinisering af disse Vægge saavel som af Sidevæggene. Spalteaabninger mangler. Den primære Bark bestaar yderst af 3—4 Lag afrundede Celler, hvis Størrelse ikke afviger stærkt, og som



Fig. 12. *Vaccinium vitis idaea*, efter at være tilsandet. ¹/₁.

alle er klorofylførende (Fig. 13 Y). Derefter følger den mere voluminøse, indre Del af Barken, som er bygget dels af mindre, afrundede eller sammentrykte og klorofylførende Celler, dels af store og mere tyndvæggede Celler, der ganske mangler Klorofylkorn (se Fig. 14). Den primære Bark er altsaa assimilerende, om end i mindre Grad end hos *V. myrtillus*, og tillige maa den antages at

¹⁾ Anatomien af Lysskuddene er, paa enkelte Punkter uklart, beskrevet af P. Segerstedt (37); ogsaa kortelig omtalt af Tedin (40).

fungere som en Art Vandvæv. I Vinterens Løb er den primære Bark rig paa Garvestoffer. I den yderste Del af Pericyklen findes

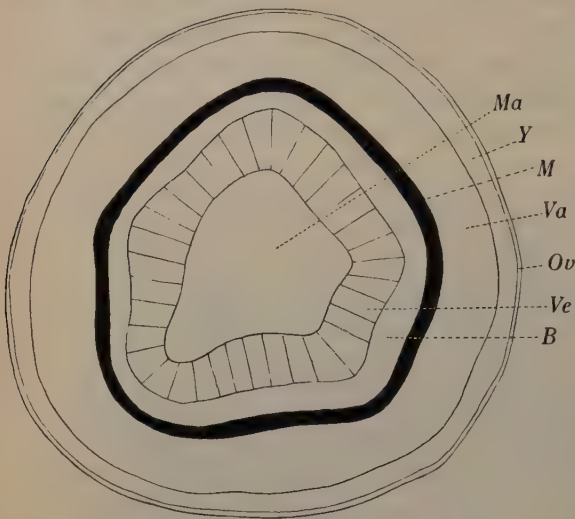


Fig. 13. Tværsnit af Lysskuddet af *V. vitis idaea*; skematiseret. *Ov*, Overhud. *Y*, Yderbark. *Va*, Vandvæv. *M*, Mekanisk Væv. *B*, Blødbast. *Ve*, Veddel. *Ma*, Marv. Ca. 30 : 1.

en næsten sluttet Ring af mekanisk Væv. Karrene er meget snævre, ca. 0,015 Mm. Marven er homogen, ret tykvægget.

I det andet Aar forholder Lysskuddet sig væsentlig som i det første; kun er en ny Aarring naturligvis under Fremvækst. Først i Skuddenes tredje Aar begynder Dannelsen af Kork, der opstaar i Pericyklen indenfor Ringen af mekanisk Væv,

men ikke er ret intensiv førend i det fjerde Aar. Overhovedet naar Korken ingen ret voluminøs Udvikling, da Skuddenes Alder jo kun er ringe (se ovenfor). Karrene er indenfor det ældre Ved ca. 0,025 Mm. vide. —

Bladene er i Form og navnlig i Størrelse ret variable. Hvad Formen angaar er Bladene snart helt ovale, snart smallere og mere tilspidsede mod begge Ender, især mod den korte Stilk. Størrelsen af Bladpladen staar i Forhold til Voksepladsen. Størst, især efter Længden, er Bladene paa Skyggebund, i Skove og Plantager; de bliver her 2,5—3,5 Cm. lange, i alt Fald for det overvejende Antals Vedkommende. Paa aabne Heder naar Længden næppe stort over 2 og 1,5 Cm. Under særlige Forhold, paa skrællet Hede eller i Sand, er Længden af Bladet kun 1 Cm. eller derunder.

Af Konsistens er Bladene som bekendt tykke og læderagtige,

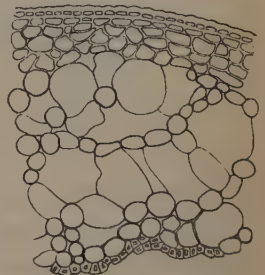


Fig. 14. Den primære Bark hos *Vacc. vitis idaea*. Ca. 80 : 1.

udvoksne paa Oversiden ganske blanke og glatte. Langs Randene er de som oftest ombøjede. Undersiden er beklædt med lange, kølleformede Kirtelhaar, der i det første Aar er mindre fremtrædende, men i det følgende, naar de er sammenfaldne, viser sig tydeligere for det blotte Øje, nemlig som mørke Prikker. Disse Kirtelhaar er af A. N. Lundstrøm angivne som Opsugningsmidler for Regn og Dug (21); Haarene persisterer og svulmer op, naar de efter Indskrumpning atter kommer i Berøring med Vand. Ogsaa Kerner har forklaret Haarene som Vandsamlere.

Fuldt udviklede er Bladene mere eller mindre horisontalt orienterede i Forhold til Lyset.

Bladene lever 3, højst 4 Vækstperioder.

De vegetative Knopper er i Efteraaret betydelig mindre end de florale, ca. 1 Mm.; de unge Bladanlæg er beskyttede af fast sammensluttede Knopskæl. Løvspringet sker i Slutningen af Maj.

Bladene er dorsiventralt byggede. Oversidens Epidermisceller er mindre end hos *Vaccinium myrtillus* og *V. uliginosum* og uden eller med svagt bølgede Sidevægge; Ydervæggene er stærkt fortykkede og kutiniserede; Spalteaabninger

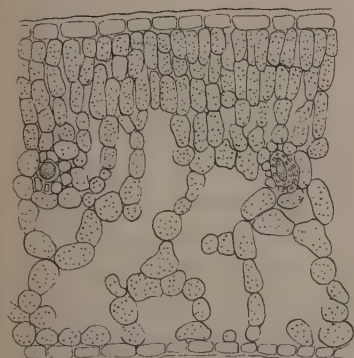


Fig. 16. Tværsnit af Bladet af *Vaccinium vitis idaea*. Ca. 80:1.

blade og Skyggeblade i Henseende til Tykkelse er som 1 til 0,6. Mekanisk Væv findes langs Bladets Rande og langs Karstrængene; særlig langs den midterste tiltager det stærkt i Bladenes andet Aar.



Fig. 15. Spalteaabning af *Vacc. v. idaea*, set fra oven og i Tværsnit. Ca. 290:1.

mangler. Undersidens Overhudsceller har bølgede Sidevægge; Ydervæggene er mindre fortykkede end Oversidens og har meget fine Kutikularlister (se Fig. 15). Spalteaabninger findes i meget rigeligt Antal (Angivelsen hos P. Maury næppe rigtig gyldig).

Palissadevævet er vel udviklet og bestaar af 5 Rækker forholdsvis korte Celler (Fig. 16). Det er 1 à 2 Celler høje i Solblade end i Skyggeblade; Stahl (38) finder i Skyggeblade 3 Lag Palissader, ligesom han angiver, at Forholdet mellem Sol-

Bladene bevarer deres Farve Vinteren igennem, og det friskt grønne Løv fremkalder en smuk Kontrast til den rødbrune Lyng.

M. H. t. Forskelligheder mellem Bladene fra sidste Vækstperiode og ældre Blade har O. Rosenberg (34) hos *V. vitis idaea* o. a. Smaabuske med vintergrønne Blade paavist, at Spalteaabningerne arbejder mere trægt hos ældre end hos de yngste Blade; hans Forsøg viser, at de ældre Blades Spalteaabninger endnu er langt fra at være lukkede, „wenn die Transpiration der diesjährigen Blätter bis auf ein Minimum aufgehört hat.“ —

De florale Knopper er allerede tidlig udviklede. I Oktober maaler den nedad bøjede Knop (det følgende Aars Blomsterstand) 2—3 Millim. i Længden. Ogsaa fuldt udviklet er Blomsterstanden, den terminalt stillede Klase, nikkende. Undertiden findes forøvrigt 2 Blomsterstande paa samme Akse — foruden den terminale en lateral, der er fremkommen lidt senere end den første.

Vaccinium vitis idaea blomstrer i Danmark i Løbet af Juni og ind i Juli Maaned. Desuden blomstrer den senere; man kan langt hen paa Efteraaret nu og da finde den i Blomst baade i Skov og paa Hede; i Slutningen af August og midt i September har jeg fundet den blomstrende ved Hornbæk; senest i fuld Blomstring 13. Oktober ved Silkeborg. Denne dobbelte Blomstring er oftere omtalt i Litteraturen, saaledes af W. O. Focke¹⁾, M. Staub²⁾ o. a. I Følge Areschoug mangler den sene Blomstring i Sydsverige.

Blomsterbiologien hos *Vaccinium vitis idaea* er saa hyppig og indgaaende omtalt af mange forskellige Forf., at den ikke berøres her³⁾. Kun skal bemærkes, at Blomsterne efter mine Iagttagelser ogsaa paa vore Heder viser sig at være entomofile.

Som Regel giver alle Klasens Blomster Frugt. Frugterne kan blive siddende meget længe; jeg har fundet dem saa sent som i sidste Halvdel af December; maaske kan de bevares endnu længere. Jo fugtigere Eftersommeren og Efteraaret er, des hurtigere falder Bærrene. I Overensstemmelse med den rigelige Fremvækst paa brændte Heder er Tyttebærplanten ogsaa paa saadanne Lokalteter stærkt fruktificerende. Der nævnes ikke sjælden Eksempler paa, at man afsvider Hedearealer for at forøge Tyttebærhøsten (sammen-

¹⁾ Abh. d. naturwiss. Ver. (Bremen); III, S. 551.

²⁾ Oesterr. bot. Zeitschr. 1875. S. 216.

³⁾ Se E. Warming (47), hvor Litteraturen anføres, og de dér gengivne Fig. illustrerer Biologien.

lign det ovenfor sagte, S. 282). Hedens Fugle fortærer formentlig en stor Mængde Bær (jfr. S. Birger, 3).

Den Mangel paa Kimplanter, som efter min Erfaring er raadende paa vore Heder, tyder paa, at Spiringsenergien er yderst ringe. Det samme synes at fremgaa af Ch. Ternetz' Forsøg (41). Og det maa for denne Plantes Vedkommende bestemt udtales, at den vegetative Formering uden al Tvivl er den eneste effektive. Og ud fra denne Forudsætning er det saa meget des mere rimeligt at betragte *V. vitis idaea* som virkelig Overlever fra de Tider, da den først optraadte i vort Land (jvfr. W. O. Focke's Advarsler mod en for ensidig Betragtning, 8).

De to ovenfor omtalte Planter, *Arctostaphylus uva ursi* og *Vaccinium vitis idaea*, danner tilsammen et meget karakteristisk Element i danske Heders Vegetation. I Modsætning til Genistatypens Arter, *Genista*-Arterne og *Sarothamnus scoparius*, der er sydligere Egnes Bidrag til Hedefloraen i Danmark, er de to Planter, der her henregnes til *Arctostaphylus*-Typen, udpræget nordiske. De forekommer endnu paa Nordtysklands Heder som karakteristisk Bestanddel af Plantedækket, men paa de store Heder i Sydvestfrankrig, de egentlige Landes, mangler de ganske — først ret højt oppe i Bjærgene, t. Eks. i Pyrenæerne, træffer man dem igen — medens i alt Fald nogle af *Genista*-Typens Arter findes isprængte de franske Heders *Ericetum*. Meget tidlig har begge Planter indfundet sig i vort Land. Og de har bevaret deres store Udbredelse væsentlig i Kraft af, at de er Hedeplanter; i alt Fald er *Arctostaphylus uva ursi* absolut knyttet til Hederne, medens *Vaccinium vitis idaea* tillige har hjemme i Ly af visse Former af Skovsamfund.

Begge Arter er rent fortrinsvis knyttede til den humøse Bund og til den mere tørre Del af Heden, til *Calluna*-Heden. Medens *Arctostaphylus uva ursi* er lyselskende og derfor ikke forekommer i vore Skove, taaler *V. vitis idaea* i højere Grad Beskygning, omend den i kraftig *Calluna*-Hede kan hænges i ikke ringe Grad. Ekspositionen er uden Betydning for begge Planters vegetative Trivsel.

Rodsystemet. Primroden spiller aabenbart ingen stor Rolle, selv om den vel er længe levende hos *Arctostaphylus*; men Adventiv-

rødder, der ikke hindrer disse Planters Optræden paa alholdige Heder, har saa meget des større Betydning for begge Arter. Rødderne mangler Rodhaar, men bærer Mykorrhizer af forskellig Type.

Skuddet og Voksemaaden. Begge Arter er Dværgbuske med Vandringsevne. *Arctostaphylus uva ursi* har transversalt geotropiske og rodslaaende Skud, hvorved den bliver kort overjordisk vandrende, og hvorved en vegetativ Formering finder Sted. Denne er i langt højere Grad udviklet hos *Vaccinium vitis idaea*, hvis underjordiske Udløbere utvivlsomt er det virksomste Middel for Artens Opretholdelse. M. H. t. Skuddenes Alder er Lysskuddene kun kort levende hos *V. vitis idaea*, men længe levende hos *Arctostaphylus*. — Det endnu urteagtige Skud er karakteriseret ved en med tykke Ydervægge udstyret Overhud og ved Mangel paa Spalteaabninger; Barken er af forskellig Bygning hos de to Arter; den egentlige Korkdannelse begynder hos begge i Pericyklen; Karrene er meget snævre; Marven ret tykvægget.

Bladene er overvintrende (og lever i 2, 3, højst 4 Vækstperioder), et væsentligt fælles Træk for Typens Organisation; i Overensstemmelse dermed er de udpræget læderagtige af Konsistens. De er fuldt udviklede gennemsigende horizontalt orienterede og dorsiventralt byggede. Overhudens Ydervægge er paa Bladets Overside tykke og kutiniserede; Spalteaabninger findes kun paa Undersiden. — Knopperne er lukkede, idet Bladanlæggene er beskyttede af fast sammensluttete Knopskæl.

Det fremgaar af Detaljbeskrivelsen, at begge Arter er kserofilt organiserede; i Følge deres Bygning er de vel skikkede til at optræde som Karakterplanter paa den aabne og relativt tørre Hede.

M. H. t. Blomstring, Frugtsætning og Frøenes Spireevne henvises til det ovenfor kortelig meddelte.

Litteratur.

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On *Stigmatopteris*, a new genus of ferns with a review of its species.

By
Carl Christensen.

The vast genus *Dryopteris*, which includes, as confined in my "Index Filicum", almost 1000 species, is together with the still larger genus *Polypodium*, the *crux* of all pteridologists. But while *Polypodium* can easily be divided into partly well limited subgenera, the majority of which I now consider good genera, the numerous species of *Dryopteris* seem to show only a slight variation as to the generic characters generally accepted. In my "Index Filicum" the genus was, it is true, divided in several subgenera, but at least two of these, *Phegopteris* and *Leptogramma* cannot be upheld, if we by the term "subgenus" are to understand an aggregation of really related species.

The proposed groups of the species of *Dryopteris* are more or less unnatural, as they, as a rule, are based on a single character. As far as I have seen by studying the American species of the genus, no single character is sufficient as base of such a grouping. Whether one or another character is chosen as base it is quickly found that it will be necessary to unite into the same group species of evidently remote alliance and vice versa. I have myself committed the same error in my revision of the American species of *Dryopteris* of the group of *D. opposita*¹⁾, in using the character "*lamina decrescens*" as an absolute mark of the group. To the group of *D. opposita* some few other species (*D. caespitosa* and others) must be referred, although they have not a decrescent lamina, and a species as *D. Thomsonii* (syn. *D. Stübelii*) is a near ally of *D. decussata*, the type of another group, *Glaphyopteris*.

¹⁾ Vid. Selsk. Skr. VII. 4. 1906.

A natural grouping of the species is, however, possible, and the American species can naturally be united into well defined groups (subgenera or even genera), the peculiarities of which are found in a row of common characters; some of these seem to be of small importance, but their stability is without question.

In a later paper I shall try to group the American species of *Dryopteris*, here I shall only point out, how minute and very often overlooked characters may be used as generic marks, when several of them constantly occur together. Among the American species of *Dryopteris* I find a little series of species, which are so uniformly different from all others that I am convinced that they must be separated from *Dryopteris* and referred to a new genus, which I have here the pleasure to propose. Below I shall in some details mention the generic characters, which are not, as will be seen, characters, which hitherto have been considered of generic value.

Stigmatopteris gen. nov.

(*Phegopteris* § *Stigmatopteris* Mett. msc. in Hb. Berol.)

Genus *Dryopteridearum* soris superficialibus dorsalibus, globosis vel parum oblongis, exindusiatis; venis liberis vel irregulariter anastomosantibus marginem non attingentibus apicibus supra prominulis clavatis. Lamina pilis omnino destituta sed ad stipitem, rachin costasque \pm squamosa, *pellucido-punctata*. Sporangii longe pedicellatis, sporis ovalibus vel subreniformibus, maturis anguste episporiatis.

To this short diagnosis I shall add the following remarks.

All species of the genus, known to me, are exindusiate, thus belonging to the old genus *Phegopteris*. In some andine forms are found, however, a "false" indusium, a lacerated scale, in structure like those of the costæ, but fixed laterally to the receptacle and protruding beyond the sporangia. Sodiro, who mentions this pseudo-indusium (Cr. vasc. quit. 295, under *P. ichtiosmum*), compares it to the inferior indusium of *Cystopteris*, which however is a true indusium covering the sporangia before maturity, which is not the case in *Stigmatopteris*. In *S. Michaelis* the receptacle bears a number of articulated, brown paraphyses, which are longer than the sporangia. These paraphyses have fully the aspect of being undeveloped or rudimentary sporangia. The sporangia are furnished with a long, articulated pedicel, and they show a

characteristic peculiarity; when the mature sporangium falls, the capsule is loosened from its pedicel, which remains fixed to the receptacle; in a mature leaf the receptacles are, therefore, hidden by a cluster of headless pedicels. In species of *Dryopteris* the pedicels of the sporangia are adherent to the capsules and the whole sporangium loosened from the receptacle.

The receptacle is generally a little oblong, dorsal and superficial on the vein. In the most developed species (*S. ichtiosma* and others) it appears to be apical on a short anterior branch from the tertiary vein, but this branch is occasionally (in other species normally) lengthened and then the sori are seen to be dorsal. This kind of forking of the veins is a character common in the genus *Polypodium* but unknown within *Dryopteris* (see fig. 13, 14).

The venation in *Stigmatopteris* is an important generic character. The ultimate veins are generally free but in several species they show a pronounced inclination to anastomosing. In *S. alloëoptera* anastomosing veins almost is the rule; here the veins are united very irregularly forming irregular areoles often with included free veinlets (fig. 11 a, b). In most other species with lobed pinnæ a similar anastomosing of the veins may be found occasionally. The veins never reach the margin as in *Dryopteris* but end in a clavate apex, which is seen on the upper surface as a raised brownish protuberance ("hydathode").

All species examined are absolutely without hairs; even the costæ above and the margins are quite glabrous, which in species of *Dryopteris* nearly always are more or less hairy. On the contrary scales occur in all species along stem, rachis, costæ and costulæ beneath. The structure of the scales is rather uniform within the genus. They are very thin, yellowish-brown with fringed or papillose edges; the cell-walls are very thin and often flexuose, the lumina large and clear. The long, hair-formed fringes often (or normally?) end in a capitate gland.

In all species the lamina is pellucid-punctate by immersed, yellow glands, much as in *Hypericum perforatum*. In some species these glands are seen as large pellucid dots, in others they are very small but then very numerous. They are only seen when held between the eye and light.

In all species the pinnæ are terminating in a long, acuminate apex, which is sharply serrate to the very point (fig. 1). In other

ferns with similarly shaped leaves the pinnæ terminate in an entire apex.

To these morphological characters a remarkable physiological peculiarity must be added, which seems to be of great importance, as a proof of the validity of the genus. While tropical ferns rarely are found infected by parasitic fungi a large number of specimens of different species of *Stigmatopteris* are injured by a black, incrusting fungus which in a following paper will be described by Messrs. Ferdinandsen and Winge.

Besides these characters, it may be stated that all species examined have a short, erect rhizome with fasciculated, not articulated stipes. The leaf has a long stem and a lanceolate or subdeltoid lamina with pinnatifid apex; the texture is as a rule thinly herbaceous. All species are from tropical America.

The position of the genus in the system must be in the suborder *Dryopterideae*, although in some respects it approaches *Polypodium*, especially its subgenus *Goniophlebium*. The nearest allied genus is, in my opinion, not *Dryopteris*, but *Phanerophlebia*, which has some characters common with *Stigmatopteris*, thus the quite hairless fronds, the shape of the lamina and partly the venation. Still the species of *Phanerophlebia* are not pellucido-punctate, their lamina has a terminal

pinna, the veins are free or anastomosing regularly and their apex not clavate.

The type of *Stigmatopteris* is *Polypodium flavopunctatum* Klf., which seems to be the same as *Aspidium rotundatum* Willd. (Plum. t. 38). The 8 first mentioned species are closely allied and can only with difficulty be distinguished from each other. Each species varies extraordinarily, and their limitation I have found more difficult to determine than that within other groups of *Dryopterideae*. My attempt here published is not quite satisfactory. The figures will give an idea of the most common form of each species. Of the next species (9—13) the same can be said. They seem to be widely different from the first species, but they are as a fact closely related to them and intermediate forms are found. In Brazil *S. prionites* is connected by intermediates with *S. caudata*, in Andes *S. nephrodioides* with *S. ichtiosma*.



1

Fig. 1. Apex of pinna of a species of *Stigmatopteris*.

In the following key the most important characters of each species are mentioned. The remarks under each species contain mostly comparative notes.

As in my former papers on ferns I have used the following abbreviations:

HB = Herbarium Berolinense.

HC = Herbarium H. Christ, Basle.

HH = Herbarium Hauniense.

HRg = Herbarium Regnellianum, Stockholm.

HW = Herbarium of the U.S. National Museum, Washington.

Key to the species.

- I. Pinnæ nearly entire, serrate or lobed not more than $\frac{1}{2}$ of the way down to the midrib, seldom a little more.
 - A. Only the uppermost pinnæ with a short decurrent base.
 1. Pinnæ linear, slightly lobed; lobes broader than long, oblique, as a rule faintly crenulate or obtusely dentate. Veins 2—5.
 - a. Pinnæ 25 cm. long by $2\frac{1}{2}$ cm. broad; veins 4—5 on each side of the costule, rather patent; sori medial; immersed glands normally distinct, but not very large or numerous; texture thin; colour generally light-green 1. *S. rotundata*.
 - b. Pinnæ 12—18 cm. long by $1\frac{3}{4}$ —2 cm. broad; veins 2—4, more erect, often very short and distant; sori small, near the costule; immersed glands indistinct, very numerous and small; texture rather thin; colour dark-green or grass-green. Brazil 2. *S. Carrii*.
 2. Pinnæ linear or lanceolate, lobed $\frac{1}{3}$ — $\frac{1}{2}$ of the way down; lobes generally longer than broad. Veins 5—7.
 - a. Pinnæ lanceolate, 12—18 cm. long, 3 cm. broad at the middle. Lobes quite entire, falcate, close; veins 6—7; sori medial, often somewhat oblong; immersed glands small, not very distinct; texture firmly herbaceous; colour generally light-green. Brazil. 3. *S. tjuccana*.
 - b. Pinnæ linear or lanceolate, lobes more or less dentate or repand; colour dark-green.
 - a. Pinnæ narrow-linear, 15 cm. long by $1\frac{1}{2}$ —2 cm. broad; lobes patent with open sinuses between; veins about 5; sori near the costule or at least

distinctly inframedial; immersed glands very large and distinct, irregular. Brazil. . . 4. *S. prionites*.

β . Pinnæ linear-lanceolate broadest at the middle; lobes falcate, rather close. Andine species.

I. Pinnæ 15—18 cm. long, $2\frac{1}{2}$ cm. broad, scarcely incised $\frac{1}{2}$ of the way down; lobes falcate, more or less dentate; veins 5—6; sori medial without paraphyses; immersed glands distinct. 5. *S. nephrodioides*.

II. Pinnæ c. 15 cm. long $2\frac{1}{2}$ —3 cm. broad, incised $\frac{2}{3}$, the upper decurrent; lobes falcate, narrow repand; veins 6—7; sori inframedial with articulated paraphyses; immersed glands very numerous and small, indistinct.

6. *S. Michaelis*.

B. Most pinnæ with a long decurrent base, those of the upper $\frac{1}{3}$ of the leaf connected by a broad wing to the rachis. Andine species (see also *S. Michaelis*).

1. Pinnæ approximate, linear, about 15 cm. long, $2\frac{1}{2}$ cm. broad, serrate. 7. *S. longicaudata*.

2. Pinnæ distant, broad-lanceolate or broad-linear, about 15 cm. long, 3—4 cm. broad, subentire or irregularly crenate or slightly lobed; veins frequently anastomosing.

8. *S. alloëoptera*.

II. Pinnæ incised to a narrow wing to the costa; segments generally toothed or lobed. Rachis often with small, appressed, peltate scales.

A. Sori without indusium-like, inferior scale.

1. Segments generally toothed throughout, separated by broad, open sinuses, often spathulate, i. e. somewhat contracted above the widened base, seldom more than 6—7 mm. broad, acute. Lower basal segments of most pinnæ considerably abbreviated. Brazil.

9. *S. caudata*.

2. Segments close, c. 1 cm. broad, sharply toothed at their apex, edges faintly crenate. Andes. 12. *S. pellucido-punctata*.

B. Most sori with an inferior, indusium-like scale. Andine and West Indian species.

1. Lower basal segment of most pinnæ abbreviated. Segments patent or oblique, not contracted above their base; costæ and costulæ beneath rather scaly. 10. *S. ichtiosma*.

2. Basal segments both much enlarged (excepting perhaps

those of the lowest pair of pinnæ); sterile leaves tripinnatifid, fertile ones with nearly entire, narrow segments; costæ with few scales beneath 11. *S. contracta*.

1. *Stigmatopteris rotundata* (Willd.) — fig. 2.

Syn. Aspidium rotundatum Willd. spec. 5: 247. 1810; *Dryopteris rotundata* C. Chr. Ind. 289. 1905. *Polypodium flavopunctatum* Klf. Enum. 108. 1824.

This species was founded by Willdenow on Plumier tab. 38, which illustrates a plant from Martinique and no doubt is the same species as *Pol. flavopunctatum* Klf., based on Sieber Fl. Martin. n. 350, gathered in the same island. With this specimen, the accepted type of the species, agree the following West-Indian specimens.

Montserrat, Ryan (HH).

Martinique, Sieber n. 350 (HB), Isert (HH), Père Duss n. 8 (HC), L'Herminier n. 115 (HB), Holm n. 37 (HB), Richard, Bot. Bélange n. 821 (HB).

Dominica, Imray n. 865 (HB), Eggers n. 668 (HB). F. E. Lloyd 1903 n. 902 (HW).

St. Vincent, H. & H. Smith n. 659 (HB), Checkley n. 7 (HB), Eggers 6869 (HW).

Guadeloupe, Duschassaing (HB), L'Herminier (HB, HC).

Grenada, Mt. St. Catharina, 2200', Eggers n. 6164 (HW), R. V. Sherring n. 141 (HW).

Trinidad, Hillebrand n. 355 (HB).

The specimens from Guadeloupe differ from the type by rachis and especially costæ being densely clothed beneath with light-brown, ovate, fringed scales; in the type the scales are very few.

var. *trinidadensis* n. var.

Trinidad, Fendler n. 98 (HB, HW), Hart 3707 and 6259 (HC), Hb. Trin. Bot. Garden 337 and 1236 (HW).

Upper pinnæ nearly entire, the lower ones with a cuneate base, irregularly lobed; rachis rather scaly, the scales with papillose margins. Veins irregular, very short or long and then sometimes connected.

In southern Brazil a long series occur of forms, which probably are all specifically distinct from *S. rotundata*. Intermediate between this species and *S. Carrii* is the form described as *Phegopteris heterocarpa* Fée, Crypt. vasc. Brésil 1: 100 tab. 30 fig. 2. 1869, Glaziou n. 2401 (HH, HRg). It resembles the former in general habit, the latter in its more distant and more erect veins and in its sori being distinctly infra-medial. From *S. tijuccana* it is distinguished mainly by its short lobes. To this form I refer the following specimens in Hb. Christ.

Sta. Catharina: Blumenau, Moeller 1891, Serra de Jaraguá, Schwacke n. 13329, Blumenau, H. Schenck n. 794.

2. *Stigmatopteris Carrii* (Bak.) — fig. 3.

Syn. Polypodium Carrii Bak. Fl. bras. 1²: 597. 1870. *Dryopteris Carrii* C. Chr. Ind. 257. 1905.

Type from Rio Janeiro, leg. Carr, not seen. To this species I refer the following specimens from Brazil, which agree very well with the original diagnosis.

San Paulo prope Barra Mansa, c. 1000 m., Wettstein & Schiffner 1901 (HC = *Aspidium alloopterum* Christ, Denkschr. Akad. Wiss. Wien 79: 16. 1907, which species does not occur in S. Brazil).

Sta. Catharina, Serra do Jurapé, Schwacke n. 13204 (HC) — Joinville P. Schmalz, Rosenstock, Fil. austr. bras. n. 106 (HB) — Blumenau, Passo Mansa, F. Haerchen, Rosenstock, Fil. austr. bras. n. 106 (HRg) — Pabst n. 799 a (HB).

This species can be distinguished from *S. rotundata* by its short pinnae (12—18 cm.) which are lesser incised, by its few (2—4) distant and erect, generally very short veins and by the sori being placed near the costule. The stem, rachis and costae beneath rather squamose. Lamina with numerous, but very small, pellucid dots.

Like the next species scarcely specifically distinct from *S. rotundata*, connected with it by intermediate forms as *Phegopteris heterocarpa* Fée, mentioned above.

3. *Stigmatopteris tijuccana* (Raddi) — fig. 4.

Syn. Polypodium (tyucanum) Raddi, Opusc. sci. Bol. 3: 288. 1819; Pl. bras. 1: 25 tab. 37. 1825; *Dryopteris tijuccana* C. Chr. Ind. 298 — *Phegopteris tenuis* Fée, Cr. vasc. Br. 1: 99 tab. 30 fig. 1. 1869.

The type of this species was collected by Raddi in Mt. Tijuca, near Rio. The following specimens agree very well with Raddi's figure: Rio, Martius (HB), Glaziou n. 7245 (HB, HH), 3333 (HH), Riedel (HRg) — S. Paulo, Santos, Mosén n. 3090 (HRg, HH).

This species differs mainly from *S. rotundata* by its shorter and broader pinnae with deeper lobes, which are close, falcate and entire, and by more (5—7) and longer veins. The pellucid dots are numerous, small, not very distinct. Texture generally firmer.

4. *Stigmatopteris prionites* (Kze.) — fig. 5.

Syn. Polypodium prionites Kze. Flora 1839: Beibl. 29; *Dryopteris prionites* C. Chr. Ind. 286. 1905; *Polypodium rotundatum* Bak. Fl. bras. 1²: 499 tab. 63. 1870.

Type from Brazil, Herb. Fl. Bras. Martii n. 305 (HB), which is very well figured in Flor. Bras. tab. 63. Other specimens: Bahia, Luschnath n. 120 (HB), Rio, Dr. Göldi (HC) — Riedel (HW).

In its typical form a very distinct species, distinguished by its narrow-linear pinnæ ($15 \times 1\frac{1}{2}$ cm.), incised about $\frac{1}{2}$ to the costæ with broad, patent, obtuse and obtusely dentated lobes with broad, open sinuses between, by its dark-green colour, its large sori placed near to the costule, and especially by its numerous and very large irregular pellucid dots. Veins about 6, rather long. Scales few.

A more developed form is

var. denticulata (Fée) — fig. 6.

Syn. Phegopteris denticulata Fée Crypt. vasc. Brés. 1: 100 tab. 32 fig. 2. 1869.

Glaziou n. 2400 part. (HH), Riedel (HH) — Minas Geraes, prope Ouro Preto, Schwacke n. 14599 (HC), prope Juiz de Fôra, Schwacke n. 14793 (HC). Parahyba, Göldi (HC) — Rio, Göldi (HC).

Pinnæ broader ($2-3\frac{1}{2}$ cm.) with longer, dentate and acute lobes; sori more removed from the costule. The broadest form of this variety approaches very much *S. caudata*, from which it can be distinguished by its large immersed glands.

Phegopteris brevinervis Fée, Crypt. vasc. Br. 1: 243 tab. 77 fig. 2. 1869, Glaziou n. 2400 part. (not n. 3333, which belongs to *S. tijuccana*) is a form of this variety with almost entire lobes and occasionally anastomosing veins. (fig. 7).

5. *Stigmatopteris nephrodioides* (Kl.) — fig. 8.

Syn. Polypodium nephrodioides Klotzsch, Linnaea 20: 384. 1847.

Type from Colombia, Dr. Karsten n. 9 (HB). Similar plants from Costa Rica, Wercklé 1904 (HC, HW) and Caracas, Lenormand n. 411 (HB).

A very critical form, which seems specifically distinct from the Brazilian species, although it shows no good character by which it can be distinguished. It differs from *S. tijuccana* by its distinctly pellucid-punctate lamina, rarely quite entire lobes and dark-green colour. From *S. prionites var. denticulata*, which it resembles in general habit, it differs by its oblique-falcate lobes and medial sori.

A form intermediate between this species and *S. ichtiosma* was collected by H. v. Türrckheim: Guatemala: Alta Verapaz, Cubilquitz, n. II. 1432 (HW); it may be a new species.

6. *Stigmatopteris Michaëlis* (Bak.) — fig. 9.

Syn. Polypodium Michaelis Baker, Journ. Bot. 1877: 164; Sodiro, Cr. vasc. quit. 293. 1893; *Dryopteris Michaelis* C. Chr. Ind. 277. 1905.

Type from Ecuador, Sodiro (HC).

Not unlike the former species in size and colour, but pinnæ lobed $\frac{2}{3}$ of the way down with long, narrow, somewhat falcate and crenate lobes. Sori near the costule with long, brown, articulated paraphyses between the sporangia. Immersed glands very small and numerous.

7. *Stigmatopteris longicaudata* (Liebm.) — fig. 10.

Syn. Polypodium longicaudatum Liebmann, Mex. Bregner 57. 1849.

Type from Mexico: Vera Cruz, Baranca de Huitamalco, Liebmann 1841 n. 739 (HH, HB).

Other typical specimens are:

Mexico: Chiapas, S. Cristobal, G. Munch (HC). — Vera Cruz, Cordova, Hugo Fink n. 67 $\frac{1}{2}$ and 123 (HW).

Guatemala, Alta Vera Paz, near the Finca Sepaquité, O. F. Cook & R. F. Griggs 1902, n. 178 and 613 (HW). Purulhá 1800 m., v. Türeckheim n. II. 1691 (HW).

Costa Rica, Wercklé 1903 (HC).

Peru, Spruce n. 4012 (HB); St. Gavan, Lechler n. 2492 (HB).

It is a pleasure to me to restore another of Liebmann's many forgotten species. This is really a very fine species, certainly very like *S. rotundata* in size, colour and texture, but at once distinguished from that species by its most pinnæ having a long decurrent base; in the upper third of the lamina the pinnæ are confluent by a broad wing to the rachis; the next following pinnæ (excepting the 2—3 lowest pairs, which are shortly petiolate) are sessile with a long decurrent, cuneate wing. The pinnæ are as a rule only serrate with oblique, sharp teeth. Veins not rarely united, especially in the specimens from Peru. Scales very few.

8. *Stigmatopteris alloëoptera* (Kze.) — fig. 11 a, b.

Syn. Polypodium alloëopterum Kze. Linnaea 25: 748. 1853; *Dryopteris alloëoptera* C. Chr. Ind. 251. 1905.

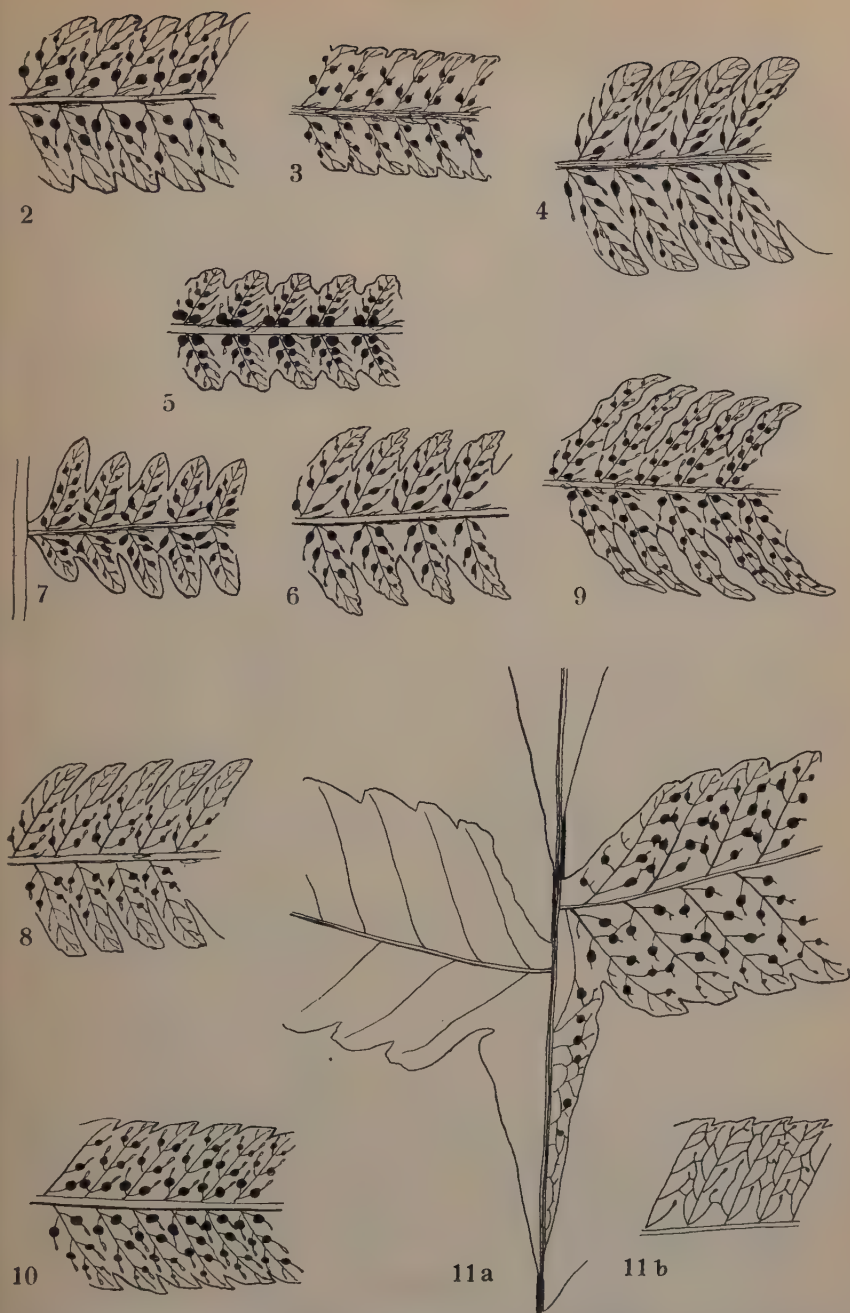
Type from Colombia, Galipan, Wagner n. 460 (not seen). To this species I refer the following specimens.

Colombia, Schlim n. 856 (HC), Santa Marta, H. H. Smith n. 1045 (HC), Coteje, Lehmann n. 8951 (HB), Ocaña Schlim n. 596 (HB).

Venezuela, Merida, Engel (HB).

Costa Rica, Carl Hoffmann (HB).

I have some doubt of this species being really distinct from *S. longicaudata*. It agrees with it in the rachis being winged above and in



Fragments in nat. size of normal pinnæ of — 2. *S. rotundata*. 3. *S. Carrii*. 4. *S. tijuccana*. 5. *S. prionites*. 6. *S. prionites* var. *denticulata*. 7. *f. brevinervis* of the same. 8. *S. nephrodioides*. 9. *S. Michaëlis*. 10. *S. longicaudata*. 11a. *S. alloëoptera* (bases of middle pinnæ). 11b. a form of *S. alloëoptera* with more copiously anastomosing veins.

the decurrent pinnæ. Most of the specimens mentioned differ, however, considerably from the former species by its shorter lamina, fewer and much broader pinnæ with irregularly lobed or only faintly crenate or repand edges, and by its frequently irregularly anastomosing veins (fig. 11). It is possible that the original specimen belongs to true *S. longicaudata*, and that the form, here called *alloeoptera*, is a variety of that species with broad pinnæ.

9. *Stigmatopteris caudata* (Raddi) — fig. 12.

Syn. Polypodium caudatum Raddi, Opusc. sci. Bol. 3: 288, 1819, Pl. Bras. 1: 25 tab. 39. 1825; Kaulf. Enum. 113. 1824; *Dryopteris caudata* C. Chr. Ind. 257. 1905.

Type from S. Brazil, described both by Raddi and Kaulfuss under the same name. The species was very well figured by Raddi, and the plant of Kaulfuss is, as shown by an original specimen, leg. Mertens (HH) a narrower form of the same. Although considerably varying in size and in breadth of the lobes, which are deeply toothed in their whole length or only faintly toothed in their outer third, the following specimens from S. Brazil must all be referred to this well-known species.

Rio. Glaziou n. 395, 2396, 6414 (HH, HC), Mosén n. 2694 (HRg, HH), Regnell n. 254 a (HRg, HC), J. W. Webb 1878 (HW), U. S. Expl. Exp. 1838—42 n. 23 (HW).

Sta. Catharina, Serra do Jurapé, Schwacke n. 13209 (HC).

Generally the lamina is distinctly pellucido-punctate; the immersed glands are in some specimens few, in others numerous, but varying considerably in size in the same leaf.

S. caudata is recorded also from the Andes and from the West Indies. The specimens seen from these localities belong, however, to the following species.

10. *Stigmatopteris ichtiosma* (Sodirol) — fig. 13.

Syn. Polypodium ichtiosmum Sodirol, Recensio: 59. 1883; Cr. vasc. quit. 294. 1893; *Dryopteris ichtiosma* C. Chr. Ind. 271. 1905. *Polypodium caudatum* Jenman, Bull. Dept. Jamaica n. s. 4: 130 and authors as to andine specimens.

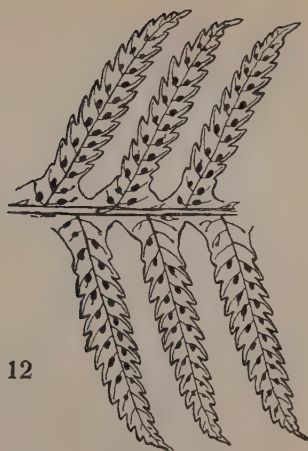
Type from Ecuador, Sodirol (HC); in the same country gathered by Stübel n. 797 (HB).

Colombia, Schlim n. 1683 (HC).

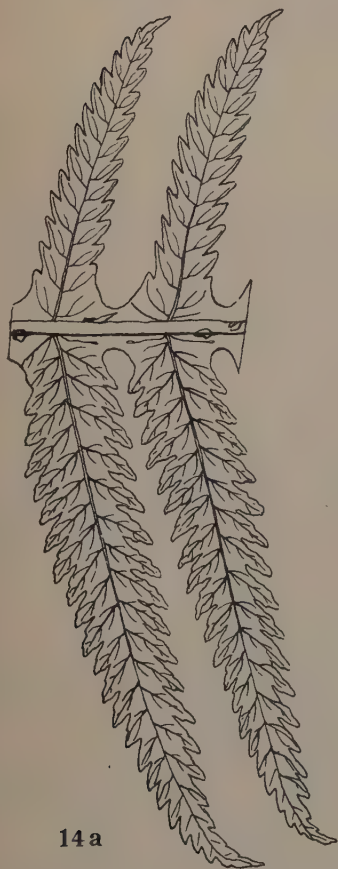
A larger species than *S. caudata* with pinnæ sometimes more than 30 cm. long, 4—5 cm. broad; segments patent or a little oblique, separated by rather narrow sinuses sharply toothed in the outer third, rather



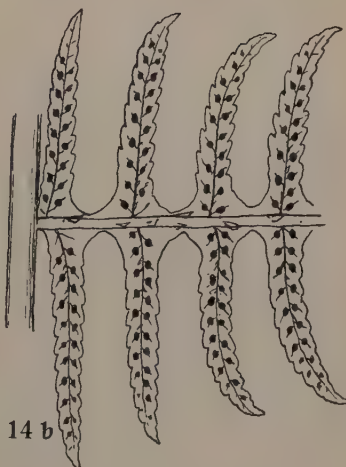
13



12



14a



14b



15

Fragments in nat. size of normal pinnæ of — 12. *S. caudata*. 13. *S. ichtiosma typica*. 14 a. *S. contracta*, middle of lower sterile pinnæ. 14 b. *S. contracta*, base of middle fertile pinna. 15. Segment of *S. pellucido-punctata*.

obtuse. Costæ and costulæ beneath rather densely squamose. Veins 10—12 or more, simple or with a very short anterior branch, on which the sori appear to be apical. Sori about medial, generally with an inferior, indusium-like scale. Lamina distinctly pellucido-punctate by numerous, rather large immersed glands.

To this species I refer the West-Indian fern hitherto determined as *P. caudatum*; the specimens seen agree, as to the essential characters, very well with the andine type, although they very much resemble *S. caudata* by their acute, oblique segments, which are toothed throughout.

Jamaica, near Cuna Cuna Pass, 2000—2700', rich wooded slope, Maxon n. 1738 (= Underwood n. 2696) — Second Breakfast Spring, below Tweedside, 2000', Underwood n. 1613 — near Bath 300—500 m., very wet forest slope, Maxon n. 2388 — Hart n. 200 (all HW).

Cuba, Wright n. 1053 (HW). Doubtful.

11. *Stigmatopteris contracta* (Christ) n. sp. — fig. 14 a, b.

Syn. Aspidium caudatum var. *contractum* Christ, Bull. L'Herb. Boiss. II. 6: 162. 1906.

Type from Costa Rica, Navarro, leg. Wercklé 1905 (HC, HW).

A near ally of *D. ichtiosma*, from which it may be distinguished by 1) its size, 2) its subdimorph leaves and 3) its sessile pinnæ with the basal segments both considerably larger than the other ones. Leaf probably more than 1½ m. high; lower pinnæ of sterile leaves up to 5 dm. long by 10 cm. broad, unequal-sided, incised to a narrow wing to the costa. Segments patent, the posterior ones much the largest, subacuminate and lobed more than ⅓ of the way down with the veins pinnate in the lobes. — Fertile leaves with narrower more distant segments, which are almost entire or obtusely serrate, falcate and separated by broad, open sinuses. Veins about 10, rarely forked, indistinct. Sori inframedial with inferior, indusium-like scale. — Leaves firm, rather thick, dark-green, distinctly pellucido-punctate. Scales few.

12. *Stigmatopteris pellucido-punctata* C. Chr. — fig. 15.

Syn. Polypodium macrophyllum Hook. sp. 4: 241. 1862 (non Mett.); *Dryopteris pellucido-punctata* C. Chr. Ind. 283. 1905.

Type from Peru, Tarapota, Spruce n. 4720.

Of this I have seen only two segments of the type specimen (HB).

Mycological Notes II.

By

C. Ferdinandsen and Ø. Winge.

A. Danish Fungi.

Phycomyceteae.

Cladochytrium Myriophylli Rostr.

Myriophyllum verticillatum L.

Our material of the above fungus, described by Rostrup in „Myk. Medd.“ IX, Bot. Tidsskr., 26. Bd., p. 305, was collected by Mag. N. Hartz in a slough near Holte, Sealand (Sept. 1908)¹⁾ and sent to the Botanical Museum in Copenhagen. We placed the *Myriophyllum*-plant in question with its turions and tumours, occasioned by the *Cladochytrium*, in a cylinder-glass by room-temperature for the purpose of studying the development of the fungus, which was not further investigated by Rostrup. — In the following our observations are given in chronological order.

1908 Sept. 17. — On macroscopic examination of transversally cut young tumours are seen figures, occasioned by the enclosed spores; the spore-filled parts namely are brown and thereby distinct from the surrounding tissues. Microscopically the structure of the tumours is the following (transverse section): The epidermis consists of one cell-layer, beneath which is seen a „cortex“ of slightly thick-walled, somewhat tangentially stretched cells, stuffed with starch. Beneath this cortex lays a thin-walled, amylaceous parenchyma with vascular bundles. In this tissue the mycelium of the fungus appears, being outmost slender and perishable, $\frac{1}{2}$ —1 μ thick; it pierces the thin cell-walls and produces numerous swellings. The mycelial swellings consist either of a single, terminal vesicle or of two, the proximal one of which is thin-walled and perishable, sending out a number of filaments, while the distal one becomes big and stuffed with oil-drops (either small and regular drops of equal

¹⁾ All the plants of *Myriophyllum*, growing in the slough, were infested by the fungus.

size or unequal ones) and by and by develops a brown, thickened membrane.

The following stage is drawn in fig. 1, *a*, which corresponds to Rostrups figures. The double-swellings, before mentioned, are namely now emancipated from the mycelium; the inferior one, the *Nebenzelle* of the German authors, is hyaline with poor and partly destroyed contents, while the superior one, the young resting spore, appears stuffed with oil



Fig. 1. *Cladochytrium Myriophylli* Rostr.

a and *b*: Resting spores with their appendicular cells; *c* and *d*: Spores germinating with hyphae; *e*: A spore being about the metamorphosis into sporangium; *f*: A sporangium exhausting the ripe zoospores; *g*: An evacuated sporangium; *h-l*: Supposed young zoosporangia on hyphae, which have been developed by vegetative germination of the resting spores (*a-l*: 660/h).

and provided with a brownish membrane. At this stage the thickness of the membrane hardly reaches $1 \mu^1$.

Octob. 26. — The knots on the stems become mouldering and begin to decay. Several of the internodia with knots have sunk to the bottom of the glass. The resting spores unchanged.

Novbr. 1. — Most part of the material is now lying on the bottom of the glass; the decaying stems put forth a pair of fresh buds. — On the

¹⁾ The „sporangia“ with „endospores“, mentioned and figured by Rostrup correspond to this stage. The closely packed oil-drops, which are often fully equal in size, have really also a striking likeness with spores.

surface of the water is only seen a single fragment of a stem, having also some fresh buds. On the microscopic examination of a knot the resting spores appear fully unchanged. The starch in the knots is degenerated.

Novbr. 26. — The turions on the decaying stems fully fresh. The resting spores essentially unchanged; their contents however is differentiated in a more dense, parietal layer rich with oil and a homogeneous central part of a less dense consistence. Rarely is seen an inwardly irregularly limited thickening of the membrane, reaching upon the whole not more than $2\ \mu$. On our later examination of the material at hand of the Museum we have found that resting spores of this type only occur as a rare exception — and a thickness of the membrane like that mentioned by Rostrup — $4\ \mu$ — has never appeared in our material. The placing of the oil-drops in a parietal layer seems to be normal¹⁾.

Dec. 21. — All the material sunk. The resting spores are fully unchanged, having the aspect as shows fig. 1, *a*. The appendicular cells with their remnants of hyphæ (in a number of until 6) are still persisting in many cases.

1909 Jan. 15. — The resting spores unchanged. The thickness of the membrane is on an average $1\frac{1}{2}\ \mu$. The turions are looking fresh and viable. The wall of the glass is covered with a thick layer of diatoms, which keep the water fresh. For this reason Bacteria and Cyanophyceae are sparingly occurring.

Febr. 10. — Resting spores unchanged, still with appendicular cells in many cases. At this time the turions begin to stretch. The lower leaves are being expanded and take up a much recurved position.

March 4. — Germinating resting spores for the first time observed. (In order to avoid giving a fragmentary picture of the germination we prefer to report the whole progress under this date). On examining many samples of our material at short intervals we have found that the spores are germinating during a pair of months — March till the beginning of May — according to the fact that the turions of *Myriophyllum verticillatum* begin to stretch about the midst of February and are developing side-branches towards the beginning of May.

In a very few cases we have observed a germination by hyphæ, as it is pictured in fig. 1, *c* and *d*. The hyphæ, which go out from

¹⁾ The same character occurs in *Cladochytrium Hippuridis* (Rostr.) De Wild. In „Annales de la Société Belge de Microscopie“ tome XVII, pag. 46 De Wildeman states that the spores of this species have a „portion centrale hyaline et réfringente, entourée d'une bordure de protoplasme granuleux et plus dense“.

two opposite points of the spore, are often much ramified and produce — partly intercalarily, partly terminally on side-branches — swellings, the further development of which we have not happened to follow; after analogy from other species however (cfr. *Cladochytrium tenue* Nowak.) they will most likely develop into zoosporangia. A germination of this type is evidently occurring as an exception; the principal rule is that the wintered resting spore itself is becoming a sporangium. This process goes on rapidly, for even on examining a great quantity of material at short intervals it is difficult to come across spores on the germinative stage. Either they are seen entirely unchanged or the germination has finished, and the evacuated burst exospores are only remaining. We have happened, however, to find different stages of the metamorphosis of the resting spores, and we are able to ascertain that the course of development is as follows: When the resting spore is approaching its metamorphosis into sporangium, its contents become somewhat nebulous and are soon divided into polygonal fields with thin dissepiments; each of these fields represents a zoospore on the point of formation. At this stage the exospore begins to vault forth (fig. e). Soon the young zoospores are becoming rounded, and coincident with the shooting forth of the endospore in a collum the zoospores are emancipated as globose or ellipsoidal bodies, 6—8 μ diam., with an excentric oil-drop. They are pressed forth through the collum, which is soon bursting.

When having in the above report always mentioned the spores being formed in the sporangium as zoospores, we ought to point out that we have not happened in any case to see their flagellum or to observe surely their swarming-stage. After analogy from other *Cladochytrium*-species with swarming spores, which lying in the sporangium have quite the same aspect as ours, we are allowed to conclude that our fungus really has zoospores, the more so as it is very difficult to observe swarming stages at all.

March 6. — In a pond in the Botanical Garden are collected turions of *Myriophyllum verticillatum*. These are on an average 4—5 cm. in length having 4—5 whorls of leaves expanded (with roots at the lower ones). Some of the turions were still fastened to the decaying stem of the mother-plant, while other ones were anchored to the bottom by means of mire, lying around the lower recurved leaves. The plants fished up are placed in two wide cylinder-glasses, in the first one 23 plants together with a great quantity of the wintered resting spores, in the second one 10, which are to be control-plants and are let free from infecting-material; for the rest *Cladochytrium* has never occurred in the very luxuriant growth of *Myriophyllum*, which is at hand in the above named pond.

In a separate glass are placed the turions wintered in culture after having been cleaned of the adhering part of the mother-plant. These plants have almost the same appearance and size as the above experiment-plants, wintered in nature.

April 22. — The *Myriophyllum*-plants are now c. 40—50 cm. in length and have begun to develop side-branches; the most part of these are still on a quite young stage.

May 1. — The first outcome of an infection observed. One of the plants in the infected culture appears curled in the top, and in the axil of a single leaf is developed a swelling of hardly 1 mm. across. On microscopic examination the slender mycelium with many vesicles rather rich in oil is seen in the interior of the swelling; the periferic parts of this is free from the mycelium and rich in starch.

May 15. — On the whole 12 plants are infested by the fungus in the infected culture. Especially the side-branches are often infested (cp. also Rostrup l. c.). By a single infection is produced either a single swelling, or more are developed near each other by wandering of the mycelium. This can thus be more or less extended, but the probability of wintering (in the rhizomes or turions) is *a priori* little, the mycelium being very slender and perishable; in good accordance to this is the fact, that our turions, wintered in culture, though coming from very violently infested mother-plants, on growing forth appear entirely sound. — The control-plants are all fully normal.

Early in June. — In the past ca. 3 weeks no more plants have been infested in the infected culture; the attack of the fungus has thus ended. The plants wintered in culture are constantly sound. The control-plants fully normal.

Myriophyllum alterniflorum D. C.

In the fall 1908 we collected in the lake Gurre Sø in northern Sealand some specimens of *Myriophyllum alterniflorum* for the purpose of trying the infesting power of *Cladochytrium* against this plant — and further to study the wintering of this species, not sufficiently known by the botanists.

We placed the plants, c. 60 cm. in length, in a cylinder-glass in a room with a temperature somewhat lower than the normal 18° C. Towards winter the leaves were decaying and sunk to the bottom, while the stems kept green. In January all the leaves were putrified. The stems still kept green and were spun over by *Beggiatoas*. In March axillar shoots began to grow forth, and we then placed some shoots in a glass together with a great infecting material of *Cladochytrium*, whose infecting power is at its full in this and the following month. On the first of May the

young shoots, in a number of c. 25, had reached a length of c. 6 cm., and roots, 4—5 cm. in length, had developed at their base. The plants were looking entirely fresh. Having in the beginning of June a length of c. 15 cm. and a quite normal and sound aspect, the plants will evidently not be infected by the fungus, and it must thus be considered as proved that *Myriophyllum alterniflorum* cannot at all be infected by *Cladochytrium Myriophylli* Rostr.

As to the systematic place of the fungus, its development shows that it must be referred to the family *Cladochytriaceae*, and the supposition of P. Magnus (Rostrup l. c.) that the fungus in question should be allied to the *Ustilaginaceae* has thus turned out not to be right. The generic name *Cladochytrium* can be upheld, when it is taken *sensu latiori*. The fungus however represents a particular type (cp. the germination), which is not fully congruent to that of any subgenus existing.

Protobasidiomyceteae.

Sebacina caesia (Pers.) Tul.

In the fall 1908 we found this species on a soaky road through a wood near Gurre in northern Sealand, where it covered the soil over ca. 10 cm. in length as a grayish blue waxy crust.

By microscopical examination of the material we found an interesting character, which — as far as we are aware — is not stated in the mycological literature, this namely, that the hyphae of the hymenium by sympodial growth perpetually are forming new basidia and thereby working out a gradual thickening of the crust. The lower



Fig. 2. *Sebacina caesia* (Pers.) Tul.
Basidia on different stages of development ($\times 500$).

basidia in such a sympodium are always seen to be decaying, the middle ones are about the maturity and the upper ones still unpartited and without sterigmata (see the fig.).

As it was interesting to know, whether the same occurred in *Sebacina incrustans* (Pers.) Tul., we examined some specimens of this fungus, collected by E. Rostrup (on *Rubus caesius* L. from Skaarup, Funen,

8. 9. 1877). It was really found to be the fact, though we found here only three basidia connected to a sympodium.

That this peculiarity has not formerly been mentioned in literature is evidently due to the fact that *Sebacina caesia* is very rare, while the sympodium by *S. incrustans* is of a less conspicuous shape.

There is no doubt that our material belongs to *S. caesia*, though the bluish colour only by moist weather is glaring. In a dry state the fungus becomes fragile and takes a more grayish tinge.

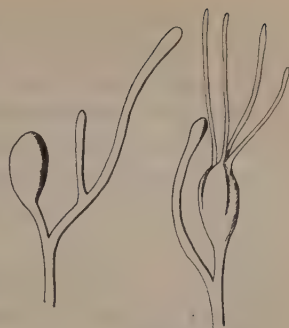


Fig. 3. *Sebacina incrustans* (Pers.) Tul.

(Basidia on different stages of development (^{550/1}).

Discomyceteae.

Beloniella biseptata Ferd. et Wge.

In our diagnosis of this fungus (Bot. Tidsskr. 28. Bd., p. 252) it is stated to grow upon *Veronica agrestis* L. from the heath at Borris in Jutland. The host-plant however was hardly determinable (entirely withered), and as after this time we found the fungus on a specimen of *Veronica serpyllifolia* L. on sandy ground near the above heath, it became probable that the original hostplant belonged to this species. A more exact examination of the material also confirmed this to be the fact.

Galactinia saniosa Schrad.

In the wood Marselisborg Skov near Aarhus we found (Aug. 1907, July 1908) many individuals of this fungus on different stages of development upon a somewhat clayey gravel-slope in deep beech-shade. The eldest individuals were plate-shaped and entirely pressed to the soil. When it is always stated in literature (Cooke, Rehm, Saccardo, Schroeter) that the species becomes at most 1 cm. in diameter, this measure is evidently being too little; our greatest specimens had namely a diameter of 3 cm., and a statement by Boudier (Histoire et classification des Discomycètes d'Europe 1907, p. 48) also shows that the measures commonly given are too small. At their fullripe stage the spores had the proportions, which are normal for the species ($15 \times 7,5 \mu$); the spore-membrane however was not more smooth — as commonly stated — but undulate-warty.

The milk, which is said to be violet or brownish-violet, was, at least in the young specimens, lively prussian-blue. The secretion of the milk

is bound to a ramified system of hyphae, 6—12 μ broad, which as well grows through the small-celled tissue of the hypothecium as through the loose big-celled pseudoparenchyma in the interior of the fungus.

This rare and interesting fungus has probably also been found at a distance of ca. 6 km. from the named locality. At all events Mr. P. Larsen, Aarhus, communicates to the authors that in the year 1904 he has found, in the wood Riis Skov, „a *Peziza* with blue milk.“

Stictis Arctostaphyli Ferd. et Wge.

Syn.: *Coccomyces quadratus* (Sch. et Kze.) Karst. var. *Arctostaphyli* Rehm (nomen nudum), Ann. Myc. V, p. 231. — *Naemacyclus Penegalsis* Rehm, Verh. Bot. Ver. Prov. Brandenb. 1908, p. 34.

The first diagnosis of this fungus is given by the authors in Bot. Tidsskr. 28 Bd., p. 253 (Dec. 1907). Our specimina were found upon *Arctostaphylos uva ursi* L. in the heath at Borris in Jutland. After this Rehm has described the fungus under the name *Naemacyclus Penegalsis* (see above!) after having published the *nomen nudum* (Jan. 1908) in the „Fungi selecti exsiccati“ edited by Jaap. The Rehmian specimina are found on the same host-plant in Penegal (Tyrol).

The fungus is very common on *Arctostaphylos* everywhere at the heath at Borris, and the area of the fungus seems upon the whole to be large. Thus we have found it in the herbarium of the Bot. Museum in Copenhagen from heaths at Hjerting in southern Jutland (leg. Warming, Juli 1886) and from Mölhede in northern Jutland (leg. M.L. Mortensen, 7.8.1905); further from Hvamner and Breidibolstadur in West-Iceland (leg. Helgi Jonsson 1897).



Fig. 4. *Barya licheno-phila* sp. n.

a: Perithecia sitting on a thallus-fragment of *Cladonia*; b: A single perithecialium; c: An ascus with spores. (a: $\frac{7}{12}$, b: $\frac{80}{1}$, c: $\frac{500}{1}$).

Pyrenomyceteae.

Barya licheno-phila sp. n. — fig. 4.

Peritheciis in sicco corneis, dense gregariis, liberis, bysso argillaceo-subroseolo insidentibus eoque primum vestitis, dein subnudis, conicis, parum ventricosus, succineis vel demum fuscidulis, 350—500 μ alt., 250—350 μ lat., ascos maturos per apicem pertusum ejaculantibus. Peridio pseudoparenchymatico, parvi-cellulari, oleoso, sub vitro diaphano. Filamentis byssi sub

vitro hyalino-fusculis, crebre septatis, guttulis oleosis repletis, ad $7\ \mu$ lat. Ascis angustissime cylindraceis, apicem versus lenissime attenuatis, globulo terminali circ. $4\ \mu$ diam. instructis, postice leniter sensimque attenuatis, sessilibus, $165\text{--}175\ \mu \times 5\text{--}5\frac{1}{2}\ \mu$. Sporidiis ascos adaequantibus, octonis, aseptatis, filiformibus, $\frac{3}{4}\ \mu$ lat., hyalinis.

Ad thallum subputridum *Cladoniae* sub *Calluna* humi jacentem in calluneto prope Borris Jutlandiae mense Augusto 1907.

Fenestella subvestita sp. n. — fig. 5.

Peritheciis denis—vicenis in cortice exteriori circinnato-confertis, ostioli disciformi-conglutinatis per peridermium pustuliformiter levatum erumpentibus, flocco flavidulo parce obsessis, zonula flavo-brunnea, e substantia mutata corticis formata, $1\frac{1}{2}\text{--}2\frac{1}{2}$ mm. diam., cinctis. Ascis cylindraceis, superne applanato-rotundatis, parte sporifera $100\text{--}125\ \mu$ long., $8\text{--}10\frac{1}{2}\ \mu$ lat., pedicello circ. $25\ \mu$ long. instructis. Sporidiis octonis vel rarius quaternis, monostichis, ellipsoideis, transverse crasse 3-septatis, loculo uno ex duobus mediis interdum septo longitudinali obliquo instructo, ad septa vix constrictulis, $15\text{--}19\ \mu \times 7\frac{1}{2}\text{--}8\frac{1}{2}\ \mu$, griseolo-brunneis, irregulari-guttatis. Paraphysibus numerosis, filiformibus, guttulatis, $3\ \mu$ crass., ascos parum superantibus. — Pycnidiis parietibus anfractuosis spurie vel omnino multilocularibus, sporulas in basidiis e basi ramosis, $15\text{--}20\ \mu$ long., solitarie acrogenas, oblongo-bacillares, $2\text{--}3\ \mu \times \frac{3}{4}\ \mu$, hyalinas foveantibus.

Ad ramos siccos corticatos *Alni glutinosae* L. in palude Lyngby Mose dicta prope Hafniam mense Februario 1909.

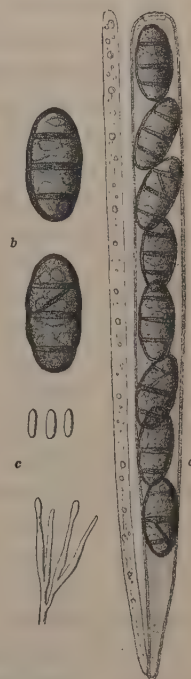


Fig. 5. *Fenestella subvestita* sp. n.

a: An ascus with spores and a paraphyse; b: Spores; c: Conidia and conidiophores. (a: $\times 800$, b: $\times 800$, c: highly magnified).

Gnomonia conformis (Berk. et Br.) Ferd. et Wge. comb. nova.

Syn.: *Sphaeria conformis* B. et Br., Curr. Spher. Hook. — *Metasphaeria conformis* (B. et Br.) Sacc., Miscel. Myc. I, p. 6. — *Calosphaeria alnicola* Cooke et Massee, Grev. XVI, p. 47. — *Massarina alnicola* (Cooke et Massee) Berl., Icon. Fung. I, p. 118 cum tab. CXXIII, fig. 3.

The above fungus is for the first time found here in Denmark by Mr. P. Larsen on *Alnus glutinosa* L. in the neighbourhood of Aarhus and by this inquirer referred to the family *Gnomoniaceae*. At the end

of the year 1908 Mr. Larsen called our attention to the fungus, and we happened to find it again in different localities, partly in the neighbourhood of Aarhus (Jan. 09), partly near Lyngby, Sealand (Febr. 09), in both places on *Alnus glutinosa* and in company with *Ditopella fusispora* De Not. By studying the fungus we also came to the result that it is to be classed into the family *Gnomoniaceae*, but we did not happen to find the fungus described under this family. As the above list of synonyms indicates, it is however well known by the mycologists, having been referred to different families under two special names. The name *conformis* has the priority, and under this name the fungus is referred by Saccardo to the genus *Metasphaeria* (see above!). In a critical note Saccardo remarks l. c.: „*Eximia* species perperam ab auctoribus ut forma *Ditopellae fusisporae* habita. Characteres *Metasphaeriae*, sed natura potius *Calosporae*, tamen vere simplex.“

As to the microscopic characters the fungus is really very like a *Calospora* and it comes therefore quite natural, when Cooke and Massee have taken it for an undescribed species of the named genus. Later on examining the Cooke'an originals Berlese has found that the fungus is without stroma, wherefore he has transferred it to the genus *Massarina* under the Cooke'an species-name (see the synonyms!).

In examining our rather rich material of this disputed fungus we have come, however, to the result that its right place is under the genus *Gnomonia*. The wall of the perithecium is namely thin, and paraphyses are quite wanting; further the young asci are lacking the characteristic structure, which is peculiar for the *Pleosporaceae*, and at the ripe stage the apex of the asci is thickened (about 5μ) and distinctly pierced by a porus.

As commonly stated the fungus has macroscopically a striking likeness with *Ditopella fusispora* De Not., in company with which it is very often occurring. At fullripe stage both fungi have a characteristic concave bottom of the perithecium, and a slightly developed clypeus can be found in both species (also after P. Larsen). The perithecia of *Ditopella* are however somewhat smaller ($1\frac{1}{2}$ — $\frac{2}{3}$ mm. while $\frac{3}{4}$ —1 mm. for the *Gnomonia*), according to which this fungus by piercing the periderm is forming a less conspicuous rupture.

Sphaeropsidaceae.

Diplodina Junci Oud.

Syn.: *Stagonospora juncicola* Rostr., Bot. Tidsskr. Bd. 26, p. 312.

Diplodina juncicola (Rostr.) Lind, Ann. Myc. V, p. 276.

In comparing type-specimina of this species from herb. Oudemans, benevolently committed to us by prof. Moll at Groningen, with the

Rostrupian originals of *Stagonospora juncicola* Rostr. it became evident that the two species are identic. The diagnosis of Oudemans being the first given (Contr. XX Mycol. Pays-Bas in Ned. Kruidk. Arch. 1904, p. 1109) the name *Diplodina Junci* Oud. has the priority, and the names published respectively by Rostrup and Lind are in future to be regarded as synonyms.

List of Fungi new to the Danish flora.

The following fungi are hitherto not cited as found in Denmark, though many of them owing to their frequency are probably observed. The species marked with * are found only in the named locality. As to the others they have been found several times by us, but only a single locality is given as an example. The list contains but a little contribution to the Danish flora of micromycetes, which in future surely will be augmented with many species.

Discomyceteae.

- **Ascobolus Crouani* Boud. — Brittled wood, Bagsværd, Sealand 17. 10. 07.
- Cenangium furfuraceum* (Roth) De Not. — *Alnus glutinosa* (L.); Hornslet, Jutland 26. 12. 08.
- **Trochila Craterium* (D. C.) Fr. — *Hedera Helix* L.; Constantinsborg, Aarhus 27. 12. 07.

Pyrenomyceteae.

- Diaporthe Dulcamarae* Nke. — *Solanum Dulcamara* L.; Lyngby, Sealand 6. 2. 09.
- D. Laschii* Nke. — *Euonymus europaeus* L.; Mosgaard, Aarhus 3. 1. 09.
- **D. Pardalota* Nke. — *Polygonatum multiflorum* Moench; Mosgaard, Aarhus 19. 8. 07.
- D. scobina* Nke. — *Fraxinus excelsior* L.; Constantinsborg, Aarhus 20. 1. 07.
- D. sorbicola* Bref. — *Sorbus Aucuparia* L.; Hareskov, Sealand 3. 2. 07.
- D. sulfurea* Fekl. — *Corylus Avellana* L.; Frederiksdal, Sealand 6. 2. 09.
- D. syngenesia* (Fr.) Nke. — *Rhamnus Frangula* L., Hornslet, Jutland 26. 12. 08.
- D. velata* Nke. — *Tilia intermedia* D. C.; Constantinsborg, Aarhus 20. 1. 07.
- Didymosphaeria brunneola* Niessl — *Rubus fruticosus* Hayne; Marselisborg, Aarhus 30. 12. 07.
- Massaria foedans* Fr. — *Populus* sp.; Constantinsborg, Aarhus Jan. 07.
- Massariella bufonia* (B. et Br.) Speg. — *Quercus pedunculata* Ehrh., Marselisborg, Aarhus 30. 12. 07.
- **M. vibratilis* (Fekl.) Sacc. — *Cerasus* (cultiv.); Mosgaard, Aarhus 3. 1. 09.

- **Nectria Fuckelii* Sacc. — *Xanthoria parietina* (L.); Constantinsborg, Aarhus 27. 12. 07.
N. Magnusiana Rehm — *Diatrypella pulvinata* Nke. Near Skanderborg, Jutland 1903.
 **Otthia Aceris* Wint. — *Acer* sp. (? *Pseudoplatanus* L.); Aarhus 2. 1. 09.
Pleomassaria siparia (B. et Br.) Tul. — *Betula verrucosa* Ehrh.; Constantinsborg, Aarhus 27. 12. 07.
Pseudovalsa profusa (Fr.) — *Robinia Pseudacacia* L.; Marselisborg, Aarhus 9. 1. 09.
 **Rosellinia ligniaria* (Grev.) Fckl. — *Alnus* sp.; Frederiksdal, Sealand 6. 2. 09.
 **Sphaerella Equiseti* Fckl. — *Equisetum hiemale* L.; Ruderskov, Sealand 1. 12. 07.
 **Stigmatea Clymenia* (Sacc.) Schroet. — *Lonicera Periclymenum* L.; Ørholm, Sealand 18. 10. 08.
 **Valsa Massariana* De Not. — *Sorbus americana* Marsh.; Botan. Garden, Copenhagen March 09.

Fungi imperfecti.

- **Ceuthospora Liriodendri* Westend. — *Liriodendron tulipifera* L.; Copenhagen 14. 12. 06.
 **Diplodia subnecta* Fr. — *Acer Pseudoplatanus* L.; Marselisborg, Aarhus 30. 12. 07.
 **Hendersonia piriformis* Otth — *Fagus silvatica* L.; Marselisborg, Aarhus 12. 1. 08.
Heterosporium Laburni Oud. — *Cytisus Laburnum* L., Frederiksdal, Sealand 3. 2. 07.
 **Dendrodochium epistroma* v. Höhn. — *Diatrypella favacea* (Fr.) Ces. et De Not.; Marselisborg, Aarhus 06.
Macrophoma Fraxini Delacroix — *Fraxinus excelsior* L.; Marselisborg, Aarhus 26. 1. 07.
 **Oedocephalum glomerulosum* (Bull.) Sacc. — *Picea excelsa* Link; Grib Skov, Sealand 22. 10. 05.
 **Placosphaeria Genistae* Brun. — *Genista anglica* L.; Flyndersö, Jutland Sept. 07 (leg. Ostenfeld).
Prosthemia betulinum Kze. — *Betula verrucosa* Ehrh.; Bagsværd, Sealand 6. 2. 09.

B. Three new foreign species.

Ophiobolus Rostrupii sp. n. — fig. 6.

Peritheciis amphigenis, primo tectis, dein epidermidem pustuliformiter levatam perforantibus, lenticulari-globosis, 300—400 μ diam., vix ostiolatis; poro circ. 30—40 μ diam. pertusis, submembranaceis, atris. Ascis cylindraceis, apice rotundatis, deorsum attenuatis, sessilibus, 130—140 $\mu \times 14$ —16 μ , juvenilibus membrano valde incrassato, maturis apice modo leniter incrassatis, poro nullo. Sporidiis octonis, filiformibus, flexilibus, sæpius parallele fasciculatis, septis 6—7 genuinis, nonnunquam paucis spuriis instructis, ad septum tertium vel quartum profundius constrictis, ceterum vix constrictulis, 115—135 μ long., ad constrictionem profundam utrobique $4\frac{1}{2}$ — $5\frac{1}{2}$ μ lat., hinc apicem versus lenissime, basim versus magis attenuatis, superne 3—4 μ , inferne 1—2 μ lat., hyalinis. Paraphysibus laxis, evanidis, tenuissimis septatis, hyalinis, ascos superantibus. J ÷.

Ad folia viva *Brunellae* sp. in insula Unalaska Aleutarum mense Julio 1891.

In studying the herbarium of E. Rostrup (in the Copenhagen Herbarium) cand. pharm. J. Lind has come across the above named fungus. On the label Rostrup has written *Linospora Brunellae* sp. n., which name however has never been published. Mr. Lind has referred the species to *Linospora Brunellae* Ell. et Ev. and cited as synonym to it *Hypospila Brunellae* Ell. et Ev. On revising the material we have found that this fungus moreover, having the spores twice as long as the above species, cannot at all belong to either of the two genera. As well the form of the asci and the spores as the presence of paraphyses refer the fungus to the genus *Ophiobolus*.



Fig. 6. *Ophiobolus Rostrupii* sp. n.
a: An ascus with spores and a paraphyse; b: A single spore.
(a and b: 650/1).

Parmularia Stigmatopteridis sp. n. — fig. 7.

Stromatibus primo simplicibus, punctiformibus, ambitu circulari, habitu fere *Asterinae*, mox autem compositis, margine lobato, denique crustuliformi-confluentibus, plagulas nigras, irregulares, nunc minutissimas, nunc ad 2 mm. elongatas, paginam inferiorem conspurcantes, formantibus. Peritheciis rimoso-hiantibus, flexuosis, inter se maeandriiformi-sinuatis, lente

etiam aegre conspicuis, raro subrectis, e centro sterili radiantibus. Ascis sessilibus, juvenilibus saccatis, apice valde incrassatis, maturis plerumque cylindraceo-clavatis, rarius clavatis vel irregularibus, $30-40\ \mu \times 10-13\ \mu$. Sporidiis octonis, conglobatis, oblongo-clavatis vel clavatis, uno-, rarius bi-septatis, medio constrictis, $12-15\ \mu \times 5-6\ \mu$, griseo-brunneolis.

Ad paginam inferiorem *Filicum*, praecipue generis *Stigmatopteridis* C. Chr. in America tropicali et subtropicali. Omnino in speciebus *Dryopteride patenti*, *Stigmatopteride alloeoptera*, *Carrii*, *caudata*, *ichtyosma*, *longicaudata*, *rotundata* inventa.



Fig. 7. *Parmularia Stigmatopteridis* sp. n.

a: The fungus on a pinna of *Stigmatopteris ichtyosma* (Sod.) C. Chr., b: Asci with spores
c: Spores; d: Evacuated asci. (a: $\frac{4}{3}$, b—d: $\frac{650}{1}$).

On revising the *Filices* in some European and American herbaria Mag. C. Christensen observed some black spots on the pinnae, which he supposed to be fungi and committed to us for determination. The fungus was found to be a new species of the genus *Parmularia*, differing from the hitherto known species¹⁾ especially by the irregular structure of the stroma.

The area of the fungus is the tropical and subtropical America.

¹⁾ For having benevolently committed to us type-specimens of some recently created Javanian species, we are here bringing prof. M. Raciborski our best thanks.

It is found only on *Filices* and is especially connected to the genus *Stigmatopteris*, recently created by C. Christensen.

On the whole the fungus has been found upon the following 8 species:

Dryopteris patens (Sw.) Kze. — Jamaica. Leg. Willm. Maxon 1904, nr. 2536.

Stigmatopteris alloeoptera (Mett.) C. Chr. — Venezuela, Merida. Leg. Engel.

S. Carrii (Bak.) C. Chr. — St^a Catharina, Serra do Jurapé. 18. 9. 1897.

S. caudata (Klf.) C. Chr. — St^a Catharina, Serra do Jurapé. 18. 9. 1897.

S. ichtyosma (Sod.) C. Chr. — Ecuador. Sodiro: Specim. Flor. Ecuador., nr. 2616.

S. longicaudata (Liebm.) C. Chr. — Guatemala, Purulha. Leg. Türkheim 1907. — N. Granada, Rio Heche. Leg. Schlim, nr. 856.

S. rotundata (Willd.) C. Chr. — Dominica. Leg. Eggers Dec. 1881. — Martinique. Flora Martin. nr. 350. — St. Vincent. Collect. H. & G. Smith 189(4?).

S. rotundata (Willd.) C. Chr. var. *trinidadensis* C. Chr. — Trinidad. Leg. A. Fendner 1878.

S. sp. n.? C. Chr. (intermediate between *S. ichtyosma* (Sod.) C. Chr. and *S. nephrodoides* (Kl.) — Guatemala. Leg. Türkheim 1906.

Pleospora tessellata sp. n. — fig. 8.

Peritheciis per corticem erumpentibus, demum superficialibus, applanatis, depressis vel pezizoideo-collapsis, ambitu circulari vel parum elongato, $\frac{1}{4}$ — $\frac{1}{2}$ mm. diam., nigris. Ascis maturis ellipsoideo-saccatis, e pressione sporidiorum hinc inde irregulariter bullatis, p. sp. 120 — $140 \mu \times 60$ — 75μ . Sporidiis octonis, disticho-conglobatis conglobatisve, ovoideis, utrinque truncatis, medio parum constrictis, transverse constanter 7-septatis, septis longitudinalibus — in fronte qualibet sporidii ternis visis — regulariter tessellatis, 40 — $50 \mu \times 21$ — 26μ , obscure brunneis, demum impellucidis, tunica mucosa persistenti, ad 4μ crass., hyalina indutis.

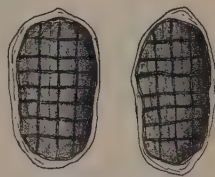


Fig. 8. *Pleospora tessellata* sp. n.
Two spores ($\times 450$).

Ad ramulos siccos corticatos *Zygophyllacearum* sp. in Chili (Herb. A. Lucae in the Copenhagen Herb. Legit Cuming).

Mindre Meddelelser.

Motion au Congrès International de Botanique à Bruxelles 1910.

Nous avons l'honneur de proposer la liste suivante de *nomina conservanda* contenant des noms génériques de *Chlorophycées*, *Phaeophycées* et *Rhodophycées*, en supposant que Linné Species plantarum 1753 soit le point de départ pour la nomenclature des Algues.

Familiæ	Nomina conservanda	Nomina rejicienda
Chlorophyceæ.		
Dasycladaceæ	Acetabularia Lamour., Nouv. Bull. sc. Philom. t. III (1812) p. 185.	Acetabulum (Tourn.) Ludw., Boehmer, Definition. Gen. Pl. (1760) p. 504.
Desmidiaceæ	Bambusina Kütz., Phyc. germ. (1845) p. 140.	?Gymnozyga Ehrenb. in Berlin. Monatsber. 1840, p. 112; Jacobs. in Botanisk Tidsskr. 8 (1876) p. 213.
Desmidiaceæ	Closterium Nitzsch, Beitr. z. Infus. (1817) pp. 60 et 67.	Echinella Achar. in Weber et Mohr, Beitr. z. Naturk. II (1810) p. 340.
Desmidiaceæ	Cosmarium (Corda) Ralfs in Ann. Nat. Hist. XIV (1844) p. 391.	?Ursinella Turpin, Aperç. organ. in Mémoir. Hist. Nat. XVI (1828) p. 316, et Kuntze, Rev. gen. pl. II, p. 922.
Hydrodictyaceæ	Hydrodictyon Roth, Tent. Flor. Germ. III (1800) p. 501.	Reticula Adans., Fam. d. Plan-tes II (1763) p. 3, ex parte.
Mesocarpaceæ	Mougeotia Ag. Syst. Alg. (1824) p. XXVI. (Non Mougeotia Humboldt, Bonpland et Kunth, Nov. gener. et spec. V (1821) p. 362 = Melochia L.)	Serpentina S. F. Gray, Nat. Arrang. Brit. Plants I (1821) p. 279 (Serpentinaria p. 299) et Agardhia ibid. p. 279 et 299.

Familiae	Nomina conservanda	Nomina rejicienda
Desmidiaceæ	Netrium Lütkenmüller in Cohns Beiträg. VIII (1902) pp. 404 et 407.	? Pleurosicyos Corda in Alm. Carlsbad 1835 p. 178.
Oedogoniaceæ	Oedogonium Link in Nees Hor. Phys. Berol. (1820) p. 5.	Prolifera Vaucher, Hist. Conf. d'eau douce (1803) p. 14 sec. O. Kuntze.
Protococcaceæ	Ophiocytium Naegeli, Gatt. einz. Alg. (1849) p. 87.	Spirodiscus Eichwald in Bull. Soc. Mosc. XX (1847) p. 285 ex parte (sine descriptione generis).
Zygnemaceæ	Spirogyra Link in Nees Horae phys. berlin. (1820) p. 5.	Conjugata Vaucher, Hist. d. Conf. d'eaux douce (1803) p. 64 ex parte (Conferve à spirales).
Desmidiaceæ	Spirotaenia Bréb. (nomen in Dict. Univ. Hist. Nat. IV (1844) p. 711, in Ralfs Brit. Desm. (1848) p. 178.	Entospira Bréb. in Kütz., Tab. Phyc. I (1847) p. 24, sine descriptione generis, tantum speciei.
Chætophoraceæ	Stigeoclonium Kütz., Phyc. general. (1843) p. 253.	Myxonema Fries in Syst. Orb. veget. (1825) p. 343 ex parte (sec. Hazen 1902) (non Corda Icon. Fung. I (1837) p. 10, t. 2).
Vaucheriaceæ	Vaucheria De Candolle in Bull. Soc. Philom. t. III (1801) p. 19.	? Ectosperma Vaucher in Mémoir. d. Conferv. (1800) p. 3.
Zygnemaceæ	Zygnema Ag. Syn. alg. Scand. (1817) p. XXXII tantum quoad sect. 2; S. F. Gray Natur. arrang. Brit. plants I (1821) p. 296.	? Lucernaria Roussel in Flore du Calvados (1806) pp. 20 et 84, sec. O. Kuntze.
Zygnemaceæ	Zygogonium Kütz., Phycol. general. (1843) p. 280.	? Leda Bory in Dict. class. Hist. Nat. 1 (1822) p. 595.

Phæophyceæ.

Laminariaceæ	Alaria Grev. Alg. Brit. (1830) pp. XXXIX, 25.	Musæfolia (um) Stackh. in Mém. soc. nat. Mosc. II (1809) pp. 53 et 66; Orgyia Stackh. Nereis Brit. Ed. 2 (1816) p. VIII.
Sporochneaceæ	Carpomitra Kütz., Phycol. general. (1843) p. 343.	Chytraphora Suhr in Flora (1834) II, p. 721.
Fucaceæ	Cystoseira Ag. Spec. alg. I (1821) p. 50.	Gongolaria Ludw., Defin. gen. plant. (1747) p. 301; ed. Böhmer (1760) p. 503.

Familiaë	Nomina conservanda	Nomina rejicienda
Desmarestiaceæ	Desmarestia Lamour, Essai d. Thalassiophytes (1813) p. 23.	Hippurina Stackh. Mém. soc. nat. Mosc. II (1809), p. 59. Hyalina Stackh. (1809) ibid. p. 88.
Punctariaceæ	Desmotrichum Kütz, Phyc. german. (1845) p. 244. Reinke Algenfl. westl. Osts. (1889) p. 56.	Diplostromium Kütz, Phyc. gen. (1843) p. 298.
Dictyotaceæ	Dictyopteris Lamour, Dissert. sur plus. espèces de Fucus, I (1805) p. 32.	Neurocarpus Web. et Mohr, Beitr. zur Naturk. I (1805) p. 300.
Dictyo- siphonaceæ	Dictyosiphon Grev., Alg. Brit. (1830) pp. XLIII, 55.	Scytosiphon (Ag. Disp. Alg. Suec. (1812) p. 24) Duby, Bot. Gallicum (1830) p. 957.
Ectocarpaceæ	Ectocarpus Lyngb., Tent. Hydr. Dan. (1819) p. 130.	Colophermum Rafinesque, Précis des déc. somiol. (1814) p. 49.
Elachistaceæ	Elachista Duby, Mém. Céram. I (1832) p. 19.	Opospermum Rafinesque, Précis des déc. somiol. (1814) p. 48.
Fucaceæ	Fucus (L. sp. plant.) Decne et Thur. Ann. sc. nat. III. sér. t. 3, 1845 p. 13.	Virsoides Donati, Storia nat. mar. (1750) p. 30. Virsodes O. Kuntze, Rev. gen. pl. II (1891) p. 929.
Fucaceæ	Halidrys (Lyngb. Tent. (1819) p. 37) Grev. Alg. Brit. (1830) pp. XXXIV, 9.	Siliquarius Roussel, Fl. du Calvados (1806) p. 94. Siliquaria Stackh. in Mém. soc. nat. Mosc. II (1809) pp. 54 et 67.
Fucaceæ	Himanthalia Lyngb., Tent. Hydr. Dan. (1819) p. 36.	Funicularius Roussel, Flore du Calvados, 2 ^e éd. (1806) p. 91.
Fucaceæ	Hormosira Endl., Gen. plant. (1839) p. 10.	Moniliformia Lamour., Dict. class. VII (1825) p. 71.
Laminariaceæ	Laminaria Lamour. in Ann. du Muséum XX (1813) p. 40.	Saccharina Stackh., Mém. soc. nat. Mosc. II (1809) p. 65. Phycodendron Eg. Olafsen et B. Povelsen, Reise igien-nem Island. I (Sørøe 1772) (edit. Germ. I (1774) p. 234).
Encoeliaceæ	Punctaria Grev., Alg. Brit. (1830) pp. XLII et 52.	Fasciata S. F. Gray, Nat. Arr. Brit. plants (1821) p. 383.
Laminariaceæ	Saccorhiza De la Pyl., Flore Terre Neuve (1824) p. 23.	Polyschidea Stackh., Mém. soc. nat. Mosc. II (1809) pp. 53, 65—66.

Familiae	Nomina conservanda	Nomina rejicienda
Encoeliaceæ	Scytosiphon (C. Ag. Disp. Alg. Suec. (1812) p. 24) Thuret in Ann. sc. nat. III (1850) vol. 14, p. 239.	Tubicutis O. Kuntze, Rev. III (1893) p. 434.

Rhodophyceæ.

Bangiaceæ	Bangia Lyngb., Tent. Hydr. Dan. (1819) p. 82.	Diadenus (Pal. de Beauv., Nouv. Dict. d'hist. nat. IX (1817) p. 378) Bory Dict. class. d'hist. nat. V (1824) p. 447.
Rhodomelaceæ	Bostrychia Mont. in Ramon de la Sagra, Hist. de l'île de Cuba (1838) p. 39.	Amphibia Stackh., Mém. soc. nat. Mosc. II (1809) pp. 58, 89.
Sphæro-coccaceæ	Calliblepharis Kütz. in Linnaea, t. 17 (1843) p. 102.	Ciliaria Stackh., Mém. soc. nat. Mosc. II (1809) pp. 54, 70.
Ceramiaceæ	Ceramium (Roth) Lyngb., Tent. Hydr. Dan. (1819) p. 117, J. Ag. 1851.	Apona Adans., Fam. d. plantes II (1763) pp. 2, 519. Episperma Rafin., Précis des déc. somiol. (1814) p. 48.
Rhodymeniaceæ	Chylocladia (Grev. in Hooker, Brit. Flora I (1833) p. 297) Thur. in Ann. sc. nat. IV t. 3 (1855) p. 18.	Sedoidea Stackh., Mém. soc. nat. Mosc. II (1809) pp. 57, 83. Sedodea O. Kuntze, Rev. gen. plant. II p. 921.
Rhodomelaceæ	Dasya Ag. Spec. Alg. II (1828) p. 116 (Dasia Ag. Systema (1824) p. XXXIV (XXXII ex errore typogr.).	Baillouviana Grisellini, Observ. s. le Scolependre (1750) pp. 25—32, tab. II. Adans., Fam. d. pl. II (1763) p. 13. Ellisius S. F. Gray, Arr. Brit. pl. I (1821) p. 333.
Delesseriaceæ	Delesseria Lamour., Essai d. Thalassiphytes (1813) p. 34.	Hydrolapathum Stackh., Mém. soc. nat. Mosc. II (1809) pp. 54, 67—68. Membranoptera Stackh., Mém. soc. nat. Mosc. II (1809) pp. 57, 85.
Nemastomaceæ	Furcellaria Lamour., Essai d. Thalassiphytes (1813) p. 25.	Fastigiaria Stackh., Mém. soc. nat. Mosc. (1809) p. 90.
Sphæro-coccaceæ	Gracilaria Grev., Alg. Brit. (1830) pp. LIV, 121.	Ceramianthemum Donati, Stor. mar. Adr. (1850) p. XXVIII.
Lemaneaceæ	Lemanea Bory in Ann. du Muséum XII (1808) p. 181.	Polysperma Vaucher, Hist. Conf. d'eau douce (1803) pp. (90) 99. Polyspermum Kuntze, Rev. gen. pl. III II (1898) p. 422.

Familiae	Nomina conservanda	Nomina rejicienda
Delesseriaceæ	Nitophyllum Grev., Alg. Brit. (1830) pp. XLVII, 77.	Scutarius Roussel in Flore du Calvados (1806) 2 ^e édit. pp. 91—92. Papyracea Stackh. Mém. soc. nat. Mosc. II (1809) pp. 56, 76.
Rhodomelaceæ	Odonthalia Lyngb., Tent. Hydr. Dan. (1819) p. 9.	Fimbriaria Stackh., Mém. soc. nat. Mosc. II (1809) p. 95.
Squamariaceæ	Peyssonnelia Decaisne, Arch. du Mus. II (1841) p. 59.	Pterigospermum Targ. Tozzetti Bertoloni, Amoen. Ital. pp. 310—312.
Gigartinaceæ	Phyllophora Grev., Alg. Brit. (1830) pp. LVI, 135.	Membranifolia Stackh., Mém. soc. nat. Mosc. II (1809) pp. 55, 75.
Rhodymeniaceæ	Plocamium Lamour., Ann. du Muséum II (1813) p. 137.	Nereidea Stackh., Mém. soc. nat. Mosc. II (1809) pp. 58, 86.
Rhizophyllidaceæ	Polyides (C. Ag. Spec. Alg. I (1822) p. 390) Grev. Alg. Brit. (1830) pp. XLV, 69.	Fastigiaria Stackh., Mém. soc. nat. Mosc. II (1809) pp. 50, 90.
Rhodomelaceæ	Polysiphonia Grev., Flora Edinensis (1824) pp. LXVII, 308.	Vertebrata S. F. Gray, Arr. Brit. pl. (1821) pp. 334—338.
Bangiaceæ	Porphyra C. Ag. Spec. Alg. I pars 2 (1822) p. 404, tribus gen. Ulvæ, Syst. Alg. II (1824) p. 32.	Phyllona Hill, Hist. of plants (1751), réimpression (1773) p. 79.
Rhodomelaceæ	Rhodomela C. Ag. Spec. Alg. I (1822) pars 2, p. 368.	Fuscaria Stackh., Mém. soc. nat. Mosc. II (1809) pp. 59, 93.
Rhizophyllidaceæ	Rhodophyllis Kütz. in Bot. Zeit. 1847 p. 23.	Bifida Stackh., Mém. soc. nat. Mosc. II (1809) pp. 59, 97.
Rhodymeniaceæ	Rhodymenia (Mont. in Ann. sc. nat. II. t. XII (1839) p. 44) J. Ag.; Rhodomenia Grev., Alg. Brit. (1830) pp. XLVIII, 84.	Palmaria Stackh., Mém. soc. nat. Mosc. II (1809) pp. 54, 69.
Sphærococcaceæ	Sphærococcus (Stackh., Ner. Brit. fasc. II (1797) pp. XVI, XXIV) Grev., Alg. Brit. (1830) pp. LVII, 137.	Coronopifolia Stackh., Mém. soc. nat. Mosc. II (1809) pp. 57, 85.
Rhodomelaceæ	Vidalia (Lamour., Dict. class. V (1824) p. 387) J. Ag. Sp. gen. ord. Alg. II (1863) p. 1117.	Euspiros Targ. Tozzetti Bertoloni, Amoen. Ital. (1819) p. 291.

Les nomina conservanda de la liste sont des noms anciens connus par tout le monde et qui ont été employés dès qu'ils furent établis, tandis que les nomina rejicienda, bien qu'ils datent d'une époque antérieure, n'ont pas été en usage pendant très longtemps, au moins 50 ans, et sont en partie très douteux.

Nous ne jugeons pas nécessaire de nommer les noms *Lamarckia* Olivi 1792 (*Codium* Stackh. 1797) et *Mamillaria* Stackh. (*Gigartina* (Stackh.) J. Ag.), et peut-être d'autres, parmi les nomina rejicienda, parce que les noms *Lamarckia* Moench (1794) et *Mamillaria* Haw. (1812) ont été insérés déjà, en 1905, parmi les nomina Phanerogamarum conservanda.

Si un terme postérieur à 1753 sera adopté comme point de départ pour un ou plusieurs embranchements d'Algues, le comité de rédaction élu en 1910 doit être chargé de démontrer les noms de notre liste qui doivent être omis.

F. Børgesen (København). L. Kolderup Rosenvinge (København).
O. Nordstedt (Lund).

La motion ci-dessus a été approuvée par:

Ed. Bornet (Paris).	M. Möbius (Frankfurt a. M.).
F. Brand (München).	G. Nadson (St. Pétersbourg).
A. D. Cotton (Kew).	Oltmanns (Freiburg i Br.).
G. B. De Toni (Modena).	C. H. Ostenfeld (København).
Falkenberg (Rostock).	Henning Eiler Petersen (København).
M. Foslie (Trondhjem).	C. Sauvageau (Bordeaux).
A. Gepp (Kew).	Josef Schiller (Triest).
Ethel S. Gepp (Kew).	Herm. G. Simmons (Lund).
M. Gomont (Paris).	Nils Svedelius (Upsala).
H. H. Gran (Christiania).	E. Teodorescu (Bucarest).
W. Heering (Altona).	A. Weber van Bosse (Eerbeek).
E. M. Holmes (Sevenoaks).	N. Wille (Christiania).
Harald Kylin (Upsala).	Veit Wittrock (Stockholm).
E. Larsen (København).	N. Woronichin (St. Pétersbourg).
E. Lemmermann (Bremen).	

Après le terme fixé par le comité la motion a été approuvée en outre par:

Frank S. Collins (Malden Mass., U. S. A.).
W. G. Farlow (Cambridge Mass., U. S. A.).
I. Lütkenmüller (Baden, N. Oest).
Schmidle (Konstanz).

Smaa Bidrag til den danske Flora V.

Af

C. H. Ostenfeld.

I et Foredrag i Dansk Botanisk Forening i December 1908 fremviste og omtalte jeg en Del Planter, der enten ikke var kendt tidligere her fra Landet eller i alt Fald hørte til de for vor Flora sjældne Arter. Et Udvalg af disse er omtalt paa de følgende Sider. Jeg har delt Fundene i to Afdelinger, eftersom man maa antage, at Planten er oprindelig hjemmehørende i vor Flora eller er indslæbt ved Menneskets Færden.

Adskillige af Angivelserne skyldes den topografisk-botaniske Undersøgelses Virksomhed.

Jeg benytter Lejligheden til at sige Tak til Indsenderne af disse Planter. Alle de i det følgende nævnte Exemplarer har nemlig været sendt ind til Universitetets botaniske Museum til Bestemmelse eller Revision, og i de fleste Tilfælde er Exemplarerne overladte Museet som Gave fra Finderne. Jo mere almindeligt det bliver blandt vort Lands plante-interesserede Almenhed at indsende til Botanisk Museum, hvad de anser for nyt, eller hvad de ikke kan klare, desto bedre bliver det muligt at følge hvert Fremskridt i Kendskabet til vor Flora og dens Forandringer.

A. Hjemmehørende, vildt-voxende Arter.

1. *Sparganium affine* Schnitzl. Var hidtil kun kendt fra Raabjærg-Mile Søer og Læsø, men er i de senere Aar fundet længere syd paa i Jylland, nemlig i en næsten udtørret Sø i Østerild Klit, Vester Hanherred (Juli 1905, E. Warming) og i Store Øxe-Sø i Mosskov nord for Hobro (Aug. 1900, E. Warming). Den vil rimeligvis findes i flere Hedesøer i Jylland.

2. *Holosteum umbellatum* L. Fyn, Brahetrolleborg (1907, Svend Andersen); tidligere ikke kendt fra Fyn.

3. *Pulsatilla vernalis* (L.) Mill. Dens Udbredelse i Vendsyssel, der hidtil omfattede Partiet Hjørring-Tolne, synes betydelig videre og vil rimeligvis vise sig at være hele det østlige, delvis lyngklædte Højdedrag, der benævnes „Jyske Aas“. Den er samlet paa Hede Vest for Dronninglund Storskov (April 1903, Otto Møller) og paa Hedebakker ved Gaarden Lunden i Hallund Sogn (1908, H. Jepsen).

4. *Anemone nemorosa* L. \times *ranunculoides* L. Loll., Berritzgaard ved Vejen Kogangen, og Guldborg-Saxkøbing Landevej ved Tyvekrogen (Maj, 1908, H. Rosenkrantz)¹⁾, Landevejsgrøft ved Ødegaard syd for Guldborg (1891, C. H. O.), Merritskov ved Bandholm (1901, Aage Møller); Taasinge, i Mængde i Bregninge Skov (1908, N. Sørensen).

5. *Polygala amarellum* Crantz (*P. amarum* L., ex pte). Jyll. ved Munkebjerg v. Vejle Fjord (1905, N. Hansen).

¹⁾ Muligvis de samme Findesteder, der i Lange's Rettelser og Tilføjelser, 1897, p. 28 anføres som: flere Steder mellem Saxkøbing og Guldborg (Dyr-læge Koch).

6. *Thesium alpinum* L. Denne Art af *Thesium* kendtes ikke tidligere her fra Landet; den adskilles fra *T. ebracteatum* Hayne ved sin 4-tallige Blomst og sin stavnsbundne Væxt (mange Stængler udgaar fra en „mangehovedet Rod“). Et Exemplar af denne Plante, der forekommer i den østlige Del af Mellem-Sverige (Blekinge, Småland og Öster-Götland) og det sydlige Mellem-Europa og Alperne, blev i 1907 indsendt af Mag. sc. J. A. Heilmann Clausen fra Holstebro-Egnen, hvor det var fundet paa Galgebakken syd for Byen i Udkanten af et Egepur. Uagtet gentagne Undersøgelser, som Hr. Heilmann Clausen paa Opfordring foretog, lykkedes det ikke at finde mere end det ene Individ. Imidlertid bør der foretages Undersøgelser paa Stedet ogsaa i andre Aar, for om mulig at faa mere at vide om denne interessante Planter Stilling i den danske Flora.

6. *Pulmonaria angustifolia* L. Denne smukke Lungeurt, som hidtil kun har været kendt fra Charlottenlund Skov (nu for længe siden forsvunden) og fra Jonstrup Vang (nu næsten fortrængt dér og ikke sét i de sidste Aar), mentes at synge paa sit sidste Vers som Borger i den danske Flora; men dette har heldigvis vist sig ikke at være Tilfældet. Paa Dansk Botanisk Forenings Ekspedition til det nordlige Langeland i Juni 1906 blev der i levende Hegn nær Frankeklint samlet en ejendommelig *Pulmonaria*, paa hvis Bestemmelse Deltagerne var usikker. Det var imidlertid *P. angustifolia*, ganske vist af lidt usædvanligt Udseende med meget store og lange, samt forholdsvis brede Grundblade. Ved at efterse Botanisk Museums Herbarium fandt jeg nu, at allerede i 1874 havde E. Rostrup samlet den paa Frankeklint og lagt Exemplarer i sit Herbarium med Paaskriften „*Pulmonaria officinalis*?“. Endvidere var en lignende bredbladet Form af samme Art samlet i 1898 ved Korsør af Højskolelærer P. M. Pedersen; dog er dette Exemplar saa bredbladet, at det muligvis snarere bør tydes som Hybriden mellem *P. officinalis* og *P. angustifolia*, der iøvrigt har voxet baade i Charlottenlund og i Jonstrup Vang.

Endelig er et fragmentarisk Exemplar af *P. angustifolia* indsendt fra Tune Landbrugsskole af Havebrugskand. Andr. Madsen (1904).

7. *Brunella grandiflora* Jacq. Tidligere kun kendt fra Dybdals Kalkbakker ved Aalborg, hvor den er stærkt truet af opvoxende Beplantning. Et enkelt Exemplar er indleveret af cand. J. Hartz, som modtog det i 1903 af Hr. Axel Wenner med Opgivelse af, at det var taget paa en Brink ved Kyndby Strand i Hornsherred (Sjæll.). Det vil være særdeles ønskeligt, om dette Findested kunde blive nøjere opklaret og eftersat.

8. *Convolvulus soldanella* L. Som omtalt af E. Warming (Den Danske Planteverdens Historie efter Istiden, Universitetets Indbydelseskrist 1904, p. 13 og 97) blev denne smukke Klitplante, der findes ved Kysterne af den sydlige Del af Nordsøen og i Nordvest naar Skotlands Kyst, fundet ved Hanstholm i 1903 af Frk. J. Grüner og ved Vorupør i 1904 af Seminarist Sørensen. Denne sidste opgiver i Følge Meddelelser fra Højskolelærer J. Jeppesen (Ranum), at den dannede en ret tæt Bevoxning paa en lav Klit tæt ude ved Stranden og paa flere Kvadratalens Størrelse. Ved Vorupør er den senere genfundet af Frk. C. Dyrberg og Seminarist

J. Ant. Jensen, ligeledes har Frk. Grüner atter i 1908 samlet den ved Hanstholm.

Allerede i 1893 samledes et Par Kimplanter af den i Stranden ved Husby (Dansk Botanisk Forenings Ekspedition, se Bot. Tids., XIX, p. XV); men der vides intet, om den „slog an“ dér eller ej.

9. *Sonchus oleraceus* L., var. *albescens* Neum. I September 1907 samlede jeg ved Skive en Form af *Sonchus oleraceus* med tilsyneladende usædvanlig blege Kurve. Ved nærmere Eftersyn var Forholdet dette: alle Kronerne med Undtagelse af de yderstes blegviolette Underside var ganske hvide, men Støvknapperne var paa Grund af rigeligt Støv stærkt gule, og Griflerne var mørkt grønne. Ved disse Farvers Blanding opstod den underlige bleggule Tone, som gjorde Formen kendelig allerede paa Afstand. Denne Form er beskrevet af Svenskeren L. M. Neuman (Berättelse öfver en resa till Danmark år 1888. — Sundsvalls Högre Allmänna Läroverks årsredogörelse 1889) efter Exemplarer fundne her i Landet ved Børkop, og afdøde O. Gelert angiver at have fundet den flere Steder ved Horsens (cfr. Medd. fra den botaniske Forening i København, Bd. 2. 1889, p. 178). Da det kunde have sin Interesse at prøve denne Afgigelses Konstans, samlede jeg modent Frø af et Individ og saaede dette i 1908 i Botanisk Have. Ialt ca. 25 Individuer lod jeg komme til Blomstring, og de havde alle den samme ejendommelige Kronfarve; man tør vel deraf slutte, at Formen er konstant¹⁾.

Nærmere Oplysning om dens Udbredelse vilde være særdeles ønskelig.

B. Indslæbte Arter.

1. *Artemisia scoparia* W. & K. Afviger fra *A. campestris* ved at være en- eller toaarig, at have opret Stængel og kuglerunde, nikkende Kurve. Jyll., Horsens Havn (1902, K. Wiinstedt).

2. *A. biennis* Willd. En- eller toaarige, enkelt fjersnitdelte Blade, Kurve samlede i bladbærende, sammenknæbne (næsten ax-lignende) Stænde. Fyn, Svendborg Havneplads (1906, P. M. Pedersen).

3. *A. annua* L. En- eller toaarig, 2—3 Gange fjersnitdelte Blade, Kurve i aaben pyramideformet Top. Har ligesom foregaaende Art fertile Skiveblomster (som *A. absinthium* og *A. vulgaris*). Sjæll., Lersøen ved København (1901, K. Wiinstedt). Tidligere fundet et Par Steder.

4. *Phyteuma nigrum* F. W. Schmidt. Ligner *P. spicatum*, men har blaa Kroner. Fyn, Brahetrolleborg Park (1907, Andersen). Loll., Hardenberg, i Skoven (1909, Alfr. Carlsen).

5. *Androsaces septentrionalis* L. (*Primulaceæ*). Denne lille, let kendelige Plante med lancetdannede, fjærnt tandede Grundblade i Roset

¹⁾ I Tilslutning hertil skal jeg nævne, at en saadan Dyrkningsprøve altid bør gaa forud for Opstillingen af nye Former, og skal som Exempel paa, hvor forsigtig man bør være, omtale, at der blev indsendt til Museet et Par Exemplarer af *Linaria Elatine*, hos hvilke alle Blade havde afrundet, hjertedannet Grund (ikke spydformet), med Opgivelse af, at alle Individerne paa samme Mark viste denne Ejendommelighed. Paa de indsendte Exemplarer var nogle modne Frugter, hvis Frø jeg saaede, og her viste det sig, at hele Afkommet (ca. 30 Individuer) var normalt — altsaa med spydformet Bladgrund. Afgigelsen var saaledes ikke konstant (skyldes maaske daarlig Ernæring?).

og lange, nøgne Skafter med en opret Skærm af smaa, hvide Blomster hører egentlig til i Bjergegne, men optræder undertiden som Ukrudt i Græsmarker, og som saadant er den fundet paa Sjæll. ved Næstved (1907, Otto Hansen), hvor den har holdt sig nogle Aar.

6. *Galium cruciatum* (L.) Scop. Fleraarig, Bladene 4 i Kransen, bredt ægdannede, Stænglen stivhaaret. Blomsterne smaa, gule, vellugtende, i Smaablomsterstande i Bladhjørnerne, Blomsterstilke efter Afblomstring tilbagekrummede. Hjemmehørende i Mellemeuropa og sydligere. I Græsmarker: Sjæll., Forlev pr. Slagelse (C. Christensen, Maj 1904), Virum (M. L. Mortensen, Juni 1907); Taasinge, ved Troense (1905, P. M. Pedersen).

7. *Ajuga genevensis* L. Uden Udløbere, Grundblade tidlig bortvisnende, langstilkede; Højblade 3-lappede, \pm spidse, Blomsterstand temmelig aaben. Græsmarker i Mellem-Europa. Sjæll., ved Ørholm (M. L. Mortensen, Juni 1907).

8. *Phacelia tanacetifolia* L. (*Hydrophyllaceæ*). Blomster i tætte Svikler, Frugten en Kapsel. Bladene 2 Gange fjersnitdelte med indskaarne Afsnit. Blomsterne helkronede, violette med langt fremragende Støvdragere. Hele Planten stivhaaret og \pm filtet. Enaarig. Vestlige Nord-Amerika. Dyrkes ofte som Hønningplante for Biavlere. Sjæll., Landevejsgrøfter v. Store Hedinge (Juni 1906, M. L. Mortensen).

9. *Nonnea pulla* (L.) D. C. *Nonnea* afviger fra *Anchusa* ved aabent Svælg (ingen Svælgskæl). Arten er fleraarig og har mørkbrune Kroner samt spidse Bægerflige. Sjæll., Kyndeløse Mark (1906, D. E. Petersen); Jyll., Frederikshavns Havneterræn (1904, Brandt). Tidligere fundet en Gang paa Fyn.

10. *N. rosea* (M. B.) Lk. Butte Bægerflige, Kronen lyserød. Enaarig. Sjæll., Haveukrudt i Roskilde (1903—04, Galschiøtt), Krogerup (1907, K. Dorph-Petersen).

11. *N. lutea* (L.) Spidse Bægerflige, Kronen gul. Enaarig. Sjæll., Aldersro ved København (1905, M. Lührs).

12. *Anchusa italica* L. Kendes let paa den store, prægtig blaa Krone. Sjæll., Kølholm i Roskilde Fjord (1907, indsendt af H. F. Feilberg).

13. *Turgenia latifolia* L. Denne Skærmpolante, der minder om *Caucalis*, men kendes paa de mindre stærkt delte Blade med bredere Afsnit, har tidligere været fundet et Par Steder ved Byer; nu synes den at blive almindeligere. Sjæll., Nykøbing (1906, C. Steincke); Jyll., Aabybro (1906, L. N. Holst), Tørring (1906, P. Jensen), Aarhus (1907, Brandt), Horsens (1904, K. Wiinstedt), Vejle (1907, H. Hess), Kolding (1909, L. C. Klinge).

14. *Melilotus indicus* (L.) A. & G. Afviger fra vore andre gulblomstrede Stenkløver-Arter ved de meget smaa Blomster og de runde Bælge. Fyn, Svendborg, Affaldsplads (1907, P. M. Pedersen).

15. *Melilotus wolgicus* Poir. (*M. ruthenicus* M. B.). Hvidblomstret som *M. albus*, men har smallere Smaablade, længere og navnlig mere fjærnt blomstrede Klaser, længere Blomsterstilke og mere aflange (ægdannede) Bælge. Jyll., Horsens, Ruderatplads (1906—07, K. Wiinstedt), Sjæll., Nørrebro mellem Haraldsgade og Jagtvejen (1907, J. Keiding).

16. *Erysimum crepidifolium* Rehb. Ligner *E. hieraciifolium*, men afviger ved at have tvedelte Stjernehaar (enkelte tredelte) paa Bladene, medens hin har lutter tredelte. Jyll., Horsens, Ruderatplads (1906, K. Wiinstedt).

17. *Thlaspi perfoliatum* L. Fra vor almindelige *T. arvense* L. afviger denne og følgende Art ved glatte Frø og omvendt-ægdannet-kile-dannet Skulpe. Denne Art er en- eller toaarig. Stængelblade ægdannede (med hjertedannet, omfattende Grund), Kronblade hvide, Frugtstand ret kort, Skulpe kortere end Stilken, 2—4 Frø i hvert Rum, Griffel meget kort. Sjæll., Jærnbanevolden mellem Vordingborg og Masnedsund i Mængde (April—Maj 1908, V. E. Olsen).

18. *T. alpestre* L. Fleraarig. Stængelblade aflange eller lancetdannede (med hjertedannet, omfattende Grund), Kronblade hvide eller lyserøde, Frugtstand stærkt forlænget, Skulpe lige saa lang som eller længere end Stilken, 4—8 Frø i hvert Rum, Griffel middel-lang. Sjæll., Kløvermark ved Sorgenfrigaard (April 1905, K. Hansen), Kløvermark ved Gentofte (1906, S. Muus).

19. *Juncus tenuis* Willd. har i mange Aar holdt sig til Silkeborg-Søernes Omegn, men er nu i den sidste Tid iagttaget flere andre Steder. Jyll., Konstantinsborg ved Aarhus (1905, J. Jeppesen), Rødding øst for Viborg (1903, J. Lind); Fyn, Gamle Hestehave ved Svendborg (1902, P. M. Pedersen); Sjæll., Sydbredden af Søllerød Sø (1907, K. Wiinstedt).

20. *Cynodon dactylon* L. (*Gramineæ*). Denne og følgende Plante hører til en Gruppe af Græsser, *Chlorideæ*, som udmærker sig ved, at Smaaaxene er sammentrykte og sidder i to, tæt stillede Rækker paa Undersiden af en trekantet lang Axe; disse Axer er stillede sammen i en skærmformet (fingret) Stand. — *Cynodon* har enblomstrede Smaaax uden Stak. Et fleraarigt krybende Græs, som er vidt udbredt i varmt-tempererede og tropiske Egne. — Fyn, Ruderatplads ved Svendborg (1906, V. Langvad); Jyll., Mølleengen (Ruderatplads) ved Aarhus (1908, J. Mathias Møller).

21. *Eleusine indica* L. Et tuedannende fleraarigt Græs fra de varmere Lande. Adskilles fra *Cynodon* ved de flerblomstrede Smaaax. Jyll., Mølleengen ved Aarhus (1908, P. Larsen og J. Mathias Møller).

Optegnelser fra en Ruderatplads.

Af

K. Wiinstedt.

I en Række af Aar (fra 1896 til 1908) væsentlig dog fra 1902 til 1908 har jeg gjort Optegnelser over Floraen paa en Plads, beliggende paa det saakaldte Grønland i Horsens. Pladsen, der er cirka en Tønde Land stor, er oprindeligt et paafyldt Stykke Brakvandseng ved „Flaskens“ (Fjordens inderste Vig) Nordbred og tilhører Byens Dampmølle, der bruger den som Affaldsplads, Ruderat, idet Affaldet fra Møllen og dens Pakhuse køres her ud. De Planter, som fremkommer, skyldes saa godt som udelukkende Dampmøllens Kornimport, idet de af andre Faktorer indførte Planter ere ganske underordnede. Pladsen laa i mange Aar aaben og befærdedes en

Del, men blev i 1905 saaledes indhegnet, at den nu er ganske utilgængelig for Uvedkommende. Da det formentlig ikke ligger saa fjernt i Fremtiden, at den bliver opdyrket eller bebygget, fremkommer jeg nu med mine Optegnelser, der væsentlig gaar ud paa at vise, hvilke indslæbte Planter der her har kunnet holde sig og faa Borgerret. Mange af de fundne Arter ere vel allerede, og har længe været anerkendte som danske Borgere, og mine Optegnelser bekræfter da tidligere lagttagelser, men andre Arter mener jeg at kunne paavise som aspirerende til Borgerretten. Jeg tænker her især paa følgende: *Brassica elongata* v. *armoracioides*, *Sisymbrium Columnae*, *Potentilla intermedia*, *Turgenia latifolia*, *Amsinckia intermedia*, *Achillea nobilis* og *Anthemis ruthenica*.

De fleste af de i Danmark indslæbte Planter hører som bekendt hjemme i et sydligere og varmere Klima end vort danske, og en af Grundene til, at etaarige Arter forsvinder igen efter eet Aars Opræden er, at de ikke naar at sætte modne Frugter i vort koldere og barskere Klima. Den enkelte Sommers gode eller daarlige Vejr (højere eller lavere Temperatur) kommer derfor ofte til at spille en stor Rolle for Arternes Genkomst paa Ruderatpladserne. Sommeren 1907, der var usædvanlig kold og regnfuld, satte saaledes sit Stempel paa Pladsen i Horsens, idet mange af de Arter, jeg kunde vente at genfinde 1908, udebleve, og Aaret opviste det mindste Artsantal, jeg hidtil har kunnet notere. Af mere haandgribelige Faktorer, der har kunnet indvirke paa Vegetationen, maa jeg nævne en Hests Afgræsning paa et Stykke af Pladsen og en Hønseskloks Afpilning og Oprodnings i Nærheden af Hønseshuset. Navnlig de sidste, der holder meget af unge Knopper og al Slags modent Frø, har sikkert ofte gjort deres til at udrydde flere af de lave og smaa Arter. Men alligevel er disse Faktors Indvirkning lille i Forhold til Pladsens Størrelse. I sit Udseende ligner Pladsen ikke saadanne i og ved København, der altid der udviser en Rigdom og Yppighed af Chenopodiaceer, Urticaceer o. s. v., men Grunden til Forskellen ligger vel i, at der paaføres de københavnske Pladser Fyld fra hele Byen, denne derimod kun fra eet bestemt Sted, og det aarligt ofte kun i to til tre Læs, der er af en ganske anden Beskaffenhed, og Jordbunden forsynes ikke nævneværdigt med Gødningssstoffer.

Det sker ofte, at en Art, som optræder et Aar og ikke naar at sætte modne Frugter, og derfor skulde forsvinde, næste Aar alligevel findes. Det ligger i, at Affaldet stammer fra eet Firma og maaske fra samme Ladning Korn, der har samme Forurening, som udkøres to Aar i Træk. Jeg har naturligvis ikke været blind for dette, og har derfor mærket mig de forskellige Arters Findesteder paa Pladsen, og tror nok med nogenlunde Sikkerhed at kunne konstatere, hvilke der virkelig har kunnet forplante sig fra det ene Aar til det andet, bortset fra deres En- eller Fleraarighed. Paa hosstaaende Liste har jeg medtaget alle Arter, som jeg anser for indslæbte paa Pladsen som Frøaffald, fraset om de ellers ere almindelige i vor Flora. Hvor mange Planter et enkelt importerende Firma kan indslæbe i Løbet af faa Aar, og hvor betydelig en Faktor nu til Dags Kornimporten spiller for Floraen, faar man tillige et Begreb om gennem Listen.

Nogle Optegnelser fra før 1896 skylder jeg Overlærer Valdemar Østerberg i Horsens.

<i>Bromus commutatus</i>	1902.	Forsvundet 1903.
— <i>tectorum</i>	1902.	Holder sig og breder sig.
<i>Setaria glauca</i>	1902.	(V. Østerberg). Ikke fundet senere.
— <i>viridis</i>	1902.	Holder sig og breder sig.
<i>Vulpia pseudomyurus</i>	1903 og 04.	Forsvundet 1905.
<i>Amaranthus retroflexus</i>	1902 og 03.	Forsvundet 1904.
<i>Chenopodium hybridum</i>	1902.	Forsvundet 1903.
<i>Kochia scoparia</i>	1902 og 03.	Forsvundet 1904.
<i>Delphinium consolida</i>	1905.	Forsvundet 1906.
<i>Silene dichotoma</i>	1896 til 08.	Holder sig i enkelte Eksemplarer.
— <i>noctiflora</i>	1902 og 03.	Forsvundet 1904. Igen 1905. Forsvundet 1906.
<i>Vaccaria parviflora</i>	1902 og 03.	Forsvundet 1904. Igen 1906. Forsvundet 1907.
<i>Barbarea praecox</i> (?)	1904.	Forsvundet 1905.
<i>Berteroa incana</i>	1896 til 1908.	Er gerne tilstede i et enkelt Eksempel hvert Aar.
<i>Neslia paniculata</i>		Forsvundet 1904.
<i>Sisymbrium Columnae</i>	1903 til 1908.	Holder sig.
— <i>Loeselii</i>	1894 (V. Østerberg).	1900 til 08. Holder sig.
— <i>sinapistrum</i>	1900 til 08.	Holder sig.
<i>Brassica elongata</i> v. <i>armoracioides</i> .	1896 til 1908.	Holder sig.
— <i>napus</i>	1900.	Forsvundet 1902.
— <i>junceae</i>	1898 (V. Østerberg).	— 1902. Forsvundet 1903.
<i>Camelina dentata</i>	1902.	Forsvundet 1903.
— <i>silvestris</i>	1896 til 1908.	Holder sig.
<i>Erysimum cheiranthoides</i>	1903 til 05.	Forsvundet 1906.
— <i>crepidifolium</i>	1906.	Forsvundet 1907.
— <i>repandum</i>	1902 til 04.	Forsvundet 1905.
<i>Lepidium draba</i>	1892 (V. Østerberg).	1896. Igen 1904 til 08. Holder sig.
— <i>perfoliatum</i>	1896.	Forsvundet 1897. Igen 1903 og 04. Forsvundet 1905. Igen 1908.
— <i>virginicum</i>	1902 til 08.	Holder sig.
(Andre <i>Lepidium ruderales</i> -Gruppen tilhørende er rimeligvis tilstede).		
<i>Reseda lutea</i>	1897.	Forsvundet 1898. Igen 1904 og 05. Forsvundet 1906.
<i>Potentilla intermedia</i>	1905 til 08.	Holder sig i enkelt Eksempel.
<i>Melilotus albus</i>	1896 til 1907.	Holder sig i enkelte Eksemplarer.
— <i>officinalis</i> Willd....	Altid tilstede.	(M. <i>arvensis</i> Wallr. derimod ikke fundet).
— <i>wolgicus</i>	1906 og 07.	Forsvundet 1908.
<i>Medicago falcata</i>	1896 til 1905.	Forsvundet 1906.
<i>Vicia pannonica</i>	1905.	Forsvundet 1906.
<i>Trifolium striatum</i>	Altid tilstede.	
<i>Caucalis daucoides</i>	1904 og 05.	Forsvundet 1906. (Men holder sig noget fra Pladsen ved Odderbanens Godsstation).

han tilføjer der, at dette helt ud stadfæster hans foran givne Beskrivelse af, at *Alaria esculenta* ikke skifter Bladet periodisk (i alt Fald paa Færøerne).

Mit omtalte Brev indeholdt ikke noget endeligt Resultat, men var kun en foreløbig Bemærkning om, hvad jeg mente at have set. Og dette

viser sig nu ved mere indgaaende Undersøgelser at maatte modificeres lidt, saaledes som det vil fremgaa af det følgende:

Alaria esculenta naar, som bekendt, sin største Længde i Løbet af Sommeren. Længdevæksten aftager stærkt henad Efteraaret. Den spise-lige Midtribbe faar paa denne Tid en afskyelig salt Smag, saa nær som et kort Stykke ved Stilken, hvor den beholder sin sødlige Smag (et Tegn paa, at den paa dette Sted endnu er frisk). Hen i December er Længdevæksten helt ubetydelig. Da det imidlertid paa Grund af urolig Sø er ret vanskeligt at komme til Stranden paa de udsatte Kyster hver Dag ved Vintertid, kan der ikke godt siges noget bestemt, om der overhovedet foregaar Vækst paa denne Tid; men saa meget er sikkert, at paa Grænsen mellem Blad og Stilk er Midtribben af *Alaria esculenta* altid frisk.

I Almindelighed bortslider Brændingen den største Del af de lange *Alariablade*, saa at der ved Aarets Begyndelse kun findes forholdsvis faa Individuer med ordentlige Blade; disse ere dog af ringe Længde (ca. 10—50 cm.) og meget forrevne. De ældre og større Eksemplarer rives lettest bort, saa at af dem sidder ofte ikke andet tilbage end den sorte Stilk; men naar Foraaret kommer, vokser



Formindsket til $\frac{1}{10}$.

der Blade paa Stilkene, dog bliver disse Blade ofte misdannede i Førstningen. Bladet udvikles f. Eks. kun paa den ene Side af Midtribben.

I Februarmaaneds første og anden Uge tiltager Længdevæksten temmelig pludselig, og da denne foregaar paa Grænsen mellem Stilk og Blad, afdør de ydre Dele af det lange Blad snart saa meget, at dets gamle Parti af Bladet bliver ubetydeligt.

Paa Grund af den hurtige Tiltagen i Vækst skydes den Del af Bladet, der i Vinterens Løb har staaet og smaagroet, rask fremefter, og da der mellem den Hastighed, hvormed Væksten foregaar før og efter den første Del af Februar, er meget stor Forskel, bliver Resultatet omtrent det

samme, som om der havde været en fuldstændig Stillestaaen, før Væksten begyndte.

Dette viser sig tydelig paa hosstaaende Billede ved en Indsnævring i Bladet.

Spidsen ned til Indsnævringen er alt, hvad Brændingen har levnet fra forrige Vækstperiode (hvad det forrevne Udseende ogsaa tydelig viser), medens den Del, der ligger mellem Indsnævringen og Stilken, er ny. Planterne bleve tagne den 24. Februar og fotograferede Dagen efter.

Indsnævringen er ikke lige tydelig hos alle Eksemplarer. Hos nogle viser der sig en eller flere Bøjninger af selve Midtribben paa dens Sted.

Medens Indsnævringen er tydelig nok i Bladets tynde Del, synes selve Midtribben at være uforandret i sin Bredde; den er kun mere frisk nedenfor end ovenfor Indsnævringen.

Den hurtige Længdevækst fortsættes nu hele Foraaret og den første Del af Sommeren, og Indsnævringerne, der ere det eneste synlige Tegn paa en Periodicitet i Bladets Vækst, slides bort af Brændingen, saa at de saa tidlig som i April ikke mere er til at finde.

Mine iagttagelser ere her fra Fagralid paa Bordøens Vestside, og jeg véd ikke, om de gælder for andre Steder end dem, der er ligestillede m. H. t. Strøm og Brænding.

Hvorledes Forholdet er i de mere stille Fjorde og Sunde, kan jeg ikke sige noget om endnu; men det er sandsynligt, at det er lidt anderledes.

Fagralid, den 10. Marts 1909.

Dansk Botanisk Forening.

Møder i 1909.

Mødet d. 16. Januar 1909.

Professor **A. Oppermann** holdt et Foredrag om Arvelighedsforskningen i Skovbrugets Tjeneste.

Jægermester L. Hauch gav supplerende Oplysninger, hentede fra Studiet af Egekulturer ved Bregentved og meddelte nogle Bemærkninger om Cieslar's Grankulturer med Frø af forskellig Proveniens, som han havde haft Lejlighed til at bese i 1908. — Proff. Warming og Johansen gjorde et Par Bemærkninger og Spørgsmaal.

Forud for Foredraget indledede Formanden Mødet med nogle Mindeord over det nylig afdøde korresponderende Medlem Prof. emer. F. Areschoug i Lund.

Mødet d. 30. Januar 1909.

Professor **E. Warming** fremviste en *Richardia æthiopica* med 2 Hylsterblade og en stor, ejendommelig formet Pude af *Statice Armeria*, tilsendte fra Hr. Bang i Nykøbing Jylland.

Professor **E. Warming** holdt derefter Foredrag om de arktiske Saxifragers Morfologi, som vil blive trykt i „Meddelelser om Grønland“. Til Foredraget knyttedes en Bemærkning af Dr. Ostenfeld.

Mødet d. 12. Februar 1909.

I Anledning af 100-Aarsdagen for Charles Darwins Fødsel holdtes et stort Fællesmøde af Biologisk Selskab, Dansk Botanisk Forening, Dansk Geologisk Forening og Naturhistorisk Forening, som overværedes af c. 250 Medlemmer af de fire Foreninger og adskillige svenske og danske Gæster. Professorerne **H. Jungersen**, **N. V. Ussing** og **E. Warming** samt Prosektor **V. Scheel** holdt Foredrag om Darwins Betydning for henholdsvis Zoologien, Geologien, Botaniken og Pathologien, hvorefter Professor **H. Høffding** talte om hans Forhold til Filosofien.

Mødet d. 27. Februar 1909.

Assistent **Harald C. Christensen** gav en Oversigt over de vigtigste Undersøgelser vedrørende Binding af elementært Kvælstof ved fritlevende Mikroorganismer. (Vil blive trykt i Tidsskrift for Landbrugets Planteavl).

Museumsinspektør Dr. **C. H. Ostenfeld** viste nogle Lysbilleder til Illustration af en Række engelske Undersøgelser over Marskvegetationen paa Bretagnes Kyst.

Hertil knyttedes en Bemærkning af Doc. Raunkiær.

Mødet d. 13. Marts 1909.

Direktør for Dansk Frøkontrol **K. Dorph-Petersen** talte om nogle Faktorer, der vedrører Ukrudfrøes Spireevne.

Efter Foredraget fulgte en længere Diskussion, i hvilken deltog Prof. Oppermann, Prof. Johannsen, Dr. Kolderup Rosenvinge, Dr. Ostenfeld, Konsulent M. L. Mortensen og Foredragsholderen.

Docent Dr. **L. Kolderup Rosenvinge** gav dernæst Meddelelse om Konserveringstilstanden af nogle Prøver af Tømmer fra Kristiansborg Slots Fundament (fra 1731).

Samme foreviste derefter en Kautschuk-Plante fra Mexiko (*Parthenium argenteum*, Guayule).

Mødet d. 27. Marts 1909.

Docent **C. Raunkiær**: Vegetationsbilleder fra Dansk Vestindien. 2. Sandy Point (Sandstrandsvegetation).

Efter Foredraget, der var ledsaget af Lysbilleder, fulgte en livlig Diskussion mellem Mag. sc. Henning E. Petersen, Stud. mag. C. Ferdinandsen, Stud. mag. Ø. Winge og Foredragsholderen. En mindre Bemærkning gjordes af Dr. Kolderup Rosenvinge.

Mødet d. 17. April 1909.

Stud. mag. **F. Heide** meddelte sine Undersøgelser over Udviklingen af Ascidieranden hos *Nepenthes*.

Mindre Bemærkninger til Foredraget gjordes af Prof. V. A. Poulsen, Prof. Ravn, Dr. Kolderup Rosenvinge og Dr. Ostenfeld.

Mødet d. 1. Maj 1909.

Professor Dr. **F. Kølpin Ravn** talte om Forholdet mellem Kaalbrokxvampens Optræden og Jordbundens Beskaffenhed i Egnene mellem Aarhus og Silkeborg.

I Diskussionen efter Foredraget deltog Prof. W. Johannsen, Dr. Kolderup Rosenvinge, Direktør Dorph-Petersen, Agronom J. Karlsson, Dr. Ostenfeld, Mag. O. Paulsen, Stud. mag. Ø. Winge og Taleren.

H. MORTENSEN.

Dansk Botanisk Forening mistede d. 12. Novbr. 1908 et af sine Æresmedlemmer, Hans Mortensen. Han var sikkert ved sin Død Foreningens ældste Medlem, baade i Alder og som Medlem. Med Vemod se vi ældre ham gaa bort, vi, der har kendt ham saa godt og har Mindet om saa mange fornøjelige Ture med ham, om hans Lune og Poesi, om hans Begejstring for Botaniken og hans utrættelige Forskning i Danmarks Flora.

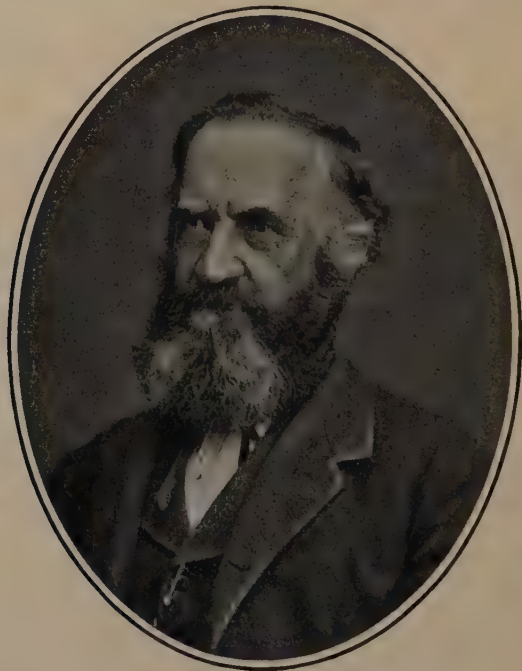
Han fødtes i Hesnæs paa Falster d. 28. April 1825. Faderen var Fisker. En af hans Sønner skrev til mig: „Livet var for Fader et Eventyr, og han selv var til sin sidste Stund et Barn midt i Eventyret. Var der noget Sted i Eventyret, som Faders Tanke gjerne dvælede ved, saa var det dette: en lille Hytte, gemt i Skoven, paa en Klint ved den brusende Strand; og i Hytten en kærlig Moder, som det var ham en skærende Hjertesorg at miste. Det var til Barndomshjemmet paa Falster og til Barneaarene, som svandt der, at hans Tanke idelig og idelig vendte tilbage.“ „Den skønne Natur om Barndomshjemmet prægede ham for Livstid. Det var først og fremmest Poesien i denne Natur, der greb hans stemningsrige Barndomssind, Glæden over det skønne, Beundringen for det mangfoldige, hellig Ærbødighed for det storladne.“

Saa kom han paa Jonstrup Seminarium. Paa sin Fod vandrede han fra sin Fødested en stor Del af Vejen op til det Sted, som i senere Aar skulde blive hans Livs Virkeplads. Tyve Aar gammel (1845) dimitteredes han fra Seminariet med Karakteren „Udmærket duelig“. Derefter blev han Huslærer paa Falster; fik saa Understøttelse af „Det Classenske Fideikommiss“ for at gennemgaa et Kursus ved Polyteknisk Læreanstalt (1847—1849) og tage en partiel Eksamen i Naturvidenskaberne. Her i København fik han bl. a. Steenstrup, hvem han beundrede, til Lærer, men blev især dog knyttet til H. C. Ørsted, efter hvem han opkaldte en af sine Sønner. I 1849 blev han Lærer ved den Classenske Agerbrugsskole paa Næsgaard; men Arbejdet her, der navnlig skulde gaa ud paa at lære Eleverne, hvorledes de skulde faa det største pekuniære Udbytte af Planterne, tiltalte ikke ham, der elskede Naturen for dens egen Skyld, og efter forskellige aandelige Kampe forlod han Skolen og blev (1853) Skolelærer i Øverup paa Falster. Her blev han gift med Datteren af en Gaardejer i Stubberup, en køn og dygtig ung Pige, Birthe Pedersdatter, der var blevet indtaget i den unge, begavede Skolelærer, som skrev i Aviserne,

spillede Fløjte ved Privatkoncerter i Nykøbing, digtede Sange og holdt gode Lejlighedstaler.¹⁾

Saa blev han faa Aar derefter (1856) Lærer ved Jonstrup Seminarium, og her levede han nu i 40 Aar, sysselsat med Undervisning af Eleverne, til forskellig Tid i Gymnastik og Svømning, Skrivning, Naturfagene, Matematik og Pædagogik; disse Fag laa ikke alle sammen lige godt for ham, og det blev sluttelig alene Dansk Stil, Naturhistorie, Geografi og Fysik foruden Pædagogik, i hvilke han underviste.

Her i en af Sjællands allerskønneste Egne ved Søndersø og Jonstrup Vang, nær Furesøen og Skovene deromkring blev han den Botaniker,



H. Mortensen.

som vi kende saa godt. Han fik det ordnet saaledes, at han havde Lørdag fri, saa at han kunde gøre botaniske Exkursioner. Han stod Joh. Lange nær og saa op til ham med Beundring; han blev en typisk Botaniker af den gamle, floristiske Skole, der kendte sine Planter, deres Ydre og deres Navne, og fandt han noget afvigende ved en eller anden, gav han vel ogsaa selv et nyt Navn. Han var en dansk Botaniker; med beundringsværdig Begejstring og Udholdenhed travede han Nordsjælland

¹⁾ Hans Hustru var en Datter af Gaardejer Peder Jørgensen Snedker og Ane Pedersdatter i Stubberup paa Falster. Hun var født 11. Okt. 1834 og døde 14. Marts 1904 paa Frederiksberg.

rundt med en umaadelig Botaniskerkasse paa Ryggen; naar saa vi andre tog med Toget til København, efter at have været paa Tur med ham i Nordsjælland, ude i, hvad han med Lune og Selvfølelse kaldte „sine“ Skove, „sine“ Enge osv., vandrede han om Natten gennem de mørke Skove til sit Hjem med den tunge Kasse paa Ryggen — Pengene maatte der jo spares paa; Lønningen var lille, og efterhaanden fødtes 6 Sønner og 6 Døtre.

At finde en sjælden Plante var Topmaalet af Lykke; det fyldte ham med en Glæde, der rigelig lønnede Besværlighederne og Savnene. Men Planterne var ham hellige; han tog kun nogle ganske faa af Sjældenhederne, f. Eks. da han med nogle andre var i Immelen i Skaane for at se Trapa natans; da han en anden Gang med Th. Schiøtz og fl. var i Møens Klintskov, og de fandt Epipogon, lagde de sig efter Sigende ned om den, næsten i hellig Beundring, men nænnede næsten ikke at røre den.

Aar efter Aar gennemvandrede Mortensen Nordsjælland og andre Egne af Danmark, undertiden udsendt af Botanisk Forening. Resultaterne har han nedlagt i mange forskellige Beretninger i Botanisk Tidsskrift (se Bot. Tidsskr. især Bd. 12, S. 197—199 og Indholdsfortegnelse til Bot. Tidsskr. Bd. 1—25, København 1904); som den betydeligste maa nævnes „Nordostsjællands Flora“, 1872 (Bot. Tidsskr. Bd. 5).

Paa Foreningens botaniske Ekspeditioner var han en yndet Fører; det var en stor Fornøjelse at se hans høje, kraftige Skikkelse med det store, mørke Skæg, næsten en Vikingefigur, skride foran for at vise eller finde Sjældenhederne, og ved saadanne Lejligheder brød hans let bevægelige, barnlige, poetiske Natur og sunde Humor forfriskende igennem. Hans Søn skriver: Fader var „let at forknytte, let at glæde; nedtrykt til Fortvivelse, naar noget gik ham imod, og jublende glad indtil overstadig Lystighed, naar Lykkens Sol skinnede.“ Som der var noget mørkt over hans Ydre, saaledes var der i Virkeligheden ogsaa noget mørkt og tungt i hans Indre og i hans Liv: men for fremmede aabenbarede dette sig ikke; vi saa kun de lyse Sider, og vi morede os herligt, naar han foretog eller til Foreningens Generalforsamlinger under Mærket „14“ (det samme, han havde i Langes „Haandbog“) skrev sine poesirige eller humoristiske Sange. Af disse sidste staar maaske den højest, der blev skrevet til d. 10. Juni 1871: „Hr. Grønlund drog til Ringsted ned for at grave, og mange lærde Mænd drog med for at gabe“ osv. Men man læse ogsaa f. Eks. hans smukke Digt ved Elias Fries' Død, eller Digtet til „Epipogon aphyllum“ og andre, der findes trykte i Foreningens i 1890 udgivne „Flora poetica“. De vidne om hans varme Kærlighed til Planterne og til de Botanikere, som han forstod og skattede, og om hans dybe, stemningsfulde, poetiske Natur.

H. Mortensens Navn hører ikke til dem, der blev viden bekendt, langt ud over Danmarks Grænser; men hans Fortjenester af Kendskabet til Danmarks Flora maa vi sætte højt; havde vi haft mange H. Mortensen'er, vilde den nu paabegyndte topografiske Undersøgelse have været overflødig.

Til sidst gjorde Alderen og Tidens nye Krav sig gældende; den 17. Juni 1896 var den sidste Dag, han underviste paa Jonstrup. Saa flyttede han til Frederiksberg, og her levede han sine sidste Aar i Minderne om Fortiden, syslende med sit Herbarium, til hvis Planter saa mange Minder knyttede sig, og med Læsning af Biografier af danske Mænd, navnlig i Brickas Lexikon; han blev nu en flittig Deltager i Møderne i „Botanisk

Forening“ og „Naturhistorisk Forening“. Saa længe han var rask og rørig, vandrede han ogsaa som i yngre Dage ud med sin Botaniskerkasse til „sine“ Skove og Enge. Han levede nær ved Zoologisk Have, der øvede stor Tiltrækning paa ham, bl. a. fordi han her kunde høre Musik, som han elskede, og her havde han endog den Glæde at høre en af sine egne Kompositioner, en vemodig Hyldest til Barndomshjemmet, blive udført.

Han var ved sin Død 83 $\frac{1}{2}$ Aar gammel. Den store Skare af Mænd, der fulgte ham til Graven, vidnede om, hvor mange Venner han havde.

Eug. Warming.

Ny Litteratur.

Hans Euler: Växtkemi, dess grunder og resultat. Andra och tredje delen. Stockholm. Gerber. 1908. (VIII + 252 Sider).

I dette Arbejdes første Del, som findes omtalt i Botanisk Tidsskrift, 28. Bd. S. XLIV, gives en Fremstilling af Plantestoffernes kemiske Beskaffenhed. Med det nu foreliggende Bind, som omfatter 2den og 3die Del af Værket, er dette afsluttet. 2den Del giver paa 90 Sider i 9 Kapitler en overmaade klar Sammenstilling af de fysisk-kemiske Forhold, som spiller Hovedrollen ved Livsvirksomheden; og i 3die Del, paa c. 150 Sider, gives i 11 Kapitler en Oversigt over Plantefysiologiens vigtigste Læresætninger, set fra et fysisk-kemisk Standpunkt.

Det er en ganske fortrinlig lille Bog, som Forfatteren her byder Biologerne, særlig da Botanikerne, og det maa haabes, at Bogen vil faa Indpas hos dem, der trænger til nogen virkelig Indsigt i fysiologiske Spørgsmaal.

I Forordet siger Forfatteren med Rette, at han vel anser Sammenhængen mellem Biologi og Kemi for endnu langt fra fuldt ud klaret; men at han dog har den Overbevisning, at Plantefysiologiens Udviklingsveje fører til Kemiens og Fysikens Omraader, og at virkelig Forstaaelse af Livsytringerne først naaes i den Grad, som de fysiologiske Erfaringer kan præciseres i kemiske og matematiske Formler. Træffende — og beroligende — følger han dog til, at den, der stræber mod dette sluttelige Maal, dog ikke derfor behøver at undervurdere den grundlæggende Betydning af de Arbejder, som førte til Opdagelsen af de paagældende Fænomener, rent kvalitativt betragtet. (Det bør sandelig ogsaa betones, at slige Opdagelser oftest betegner en mindst lige saa stor Originalitet som senere nøjagtige kvantitative Undersøgelser, selv om disse er nødvendige for at faa fuldere Klarhed over Tingene. Paa Forskningens mere fremskredne Stadier naaes helt nye Opdagelser dog sædvanlig kun gennem nøjagtig kvantitativ Analyse i dette Ords videste Betydning.)

Bogens Program fremgaar af det anførte; Gennemførelsen af Programmet er fortrinlig; særlig er Stofskiftet behandlet mesterligt. Her skal ikke gaaes ind paa Detailler, men det Euler'ske Værk kan paa det varmeste anbefales til vort botaniske Publikum som lærerigt og tankevækkende. I en Tidsperiode, hvor indenfor Naturhistorien taagede vitalistiske Tendenser — dem, Forf. i Forordet let dolerer over — truer med at forhale en virkelig biologisk Forsknings Fremskridt, maa et Skrift som det foreliggende hilses med særlig Glæde.

W. Johannsen.

O. G. Petersen: Forstbotanik. Paa Grundlag af Forelæsninger ved den kgl. Veterinær- og Landbohøjskole. Med 230 Figurer i Teksten. København 1908. G. B. N. F. 442 Sider. Pris 8 Kr.

Naar Forf. efter i en Aarrække at have doceret Forstbotanik ved Landbohøjskolen, har bestemt sig til at udgive sine Forelæsninger i en Bog, kunde man paa Forhaand vente, at denne vilde bære Præg af, at Forf.s videnskabelige Arbejder i den Tid fortrinsvis har haft denne Videnskabsgren til Genstand, og det maa da ogsaa siges, at den foreliggende Bog i høj Grad vidner om at være et Førstehaandsarbejde. Den er for en væsentlig Del bygget paa personlige iagttagelser og er udelukkende illustreret med originale Figurer, men indeholder dog ogsaa talrige Henvisninger til den forstbotaniske Litteratur.

Bogen falder i en almindelig og en systematisk Del. I den første behandles Knopperne, Løvspring, Forgrening, Stammens og Grenenes indre Bygning, et vigtigt og indholdsrigt Kapitel, som omfatter 79 Sider, fremdeles Stofvandring og Magasinering, Træernes Væxt- og Trivsel, og Træernes Formering.

I den systematiske Del omhandles de enkelte Træer og Buske i systematisk Orden, først og fremmest vore Skovtræer og vildtvoxende Vedplanter, men ogsaa en Del almindeligere forekommende Park- og Have-træer, og tilsidst Skovurterne samt i et Tillæg nogle Mosser og Løvsporeplanter.

Bogen er vel særlig bestemt til at benyttes som Læremiddel ved Forstmændenes Undervisning ved Landbohøjskolen, men den henvender sig forøvrigt til Alle, der har Interesse for Skoven og dens Natur; den indholdsrige Bog kan paa det bedste anbefales disse, da den giver fyldige Oplysninger om meget, hvorom man hidtil har savnet en Fremstilling i den danske Litteratur.

L. K. R.

Botany of the Færöes, based upon Danish investigations.
Part III. 12 Tavler. Copenhagen and Christiania. London. 1908.
Side 683—1070 + XXVIII.

Med denne Part er det anseelige og statelige Værk, hvis Udgivelse begyndte i 1901, afsluttet. Dermed er ikke alene alle Floraens enkelte Afdelinger bearbejdede, men ogsaa Plantesamfundene udførligt behand- lede, og der er endda givet korte Oversigter over Øernes Geografi, Topografi, Geologi, Klima, Agerdyrkning og Insektfauna m. m. Værket udgør nu 1070 Sider samt et Appendix paa 28 Sider og er udstyret med 24 Tavler. Værket bestaar af 29 Afhandlinger, der skyldes 13 forskel- lige Forfattere, blandt hvilke maa fremhæves Dr. F. Børgesen og Dr. C. H. Ostenfeld som dem, der har skrevet de fleste og de største Bi- drag. Det slutter med en Fortale af Prof. Warming, som satte Under- søgelsen i Gang, som har forestaaet Værkets Udgivelse, og som ogsaa har leveret Bidrag til det.

Fr. Weis: Livet og dets Love, en letfattelig Fremstilling af den almindelige Biologi. 1.—5. Hefte. Kjøbenhavn 1908—09. (Gad.)

Under den stærke Udvikling, som i nyere Tid finder Sted indenfor de biologiske Videnskaber, er det umuligt for en enkelt Forsker at følge med paa alle Omraader af disse Videnskaber, og de fleste videnskabeligt ar-

bejdende Forskere vilde vistnok derfor ikke have Mod til at give sig i Lag med en saa omfattende Opgave som at skildre Livet og dets Love. Imidlertid er der sikkert nok Trang til en saadan Skildring, og man maa være Prof. Weis taknemlig for, at han har paataget sig at give den, thi han har utvivlsomt Betingelser for at kunne gennemføre den paa tilfredsstillende Maade, først og fremmest en levende, almen naturvidenskabelig Interesse, dernæst Øvelse i at skrive populært, og endelig har han paa enkelte Omraader skaffet sig særlig Indsigt ved videnskabelige Arbejder. De foreliggende Hefter vidner da ogsaa om, at Forf. har nedlagt et betydeligt Arbejde i Bogen, og at denne bliver interessant og lærerig og let læselig. Af særlig Interesse er, at Planter og Dyr behandles jævnsides indenfor de enkelte Kapitler, saa at Læseren faar et levende Indtryk af de for de levende Væsener fælles Ejendommeligheder.

Efter en kort Indledning, hvor der bl. a. gives en kort historisk Oversigt med Portrætter af enkelte fremragende Forskere, gives i Bogens første Halvdel en Fremstilling af de almindelige Livsbetingelser, medens den anden Halvdel skal omhandle de fundamentale Livsytringer. I de udkomne Hefter omtales Organismernes elementære Bygning, Livsenheder, Individbegrebet og Evolutionen, og derefter Omverdenens Indflydelse: Næringsstoffer, Vand, Ilt, Varme, Lys o. a. Straaler.

At der hist og her kan paavises Unøjagtigheder, kan ikke undre i et Værk som dette, hvor Stoffet skal hentes fra saa mange Sider. Saaledes angives S. 112, at det næppe vil være muligt for nogen autotrof Plante at opretholde Livet i over 50 Meters Dybde, skønt man for længe siden har konstateret Plantevæxt i over 100 M. Dybde i Middelhavet. Samme Side angives, at Sargassotangen ved luftfyldte Blærer holdes svævende paa Vandet, hvilket skal være i Vandet. At Vandets Temperatur fra en Dybde af 300—400 Meter altid er omkring $+ 2^{\circ}$ kan vel være rigtigt for enkelte Steder, men er meget langt fra at være almenlydigt. Naar Forf. S. 107 taler om, at en Plante kan voxе uden at forøge sin Vægt, menes naturligtvis Tørvægt. Endnu skal blot nævnes, at naar Forf. under Evolutionen udtaler, at man har „kunnet paavise en Udviklingsgang i hele den levende Natur overhovedet fra den ene Form til den anden“ . . . „fra Art til Art eller fra Stamme til Stamme“ o. s. v., saa vilde det have været paa sin Plads, hvis Forf. her havde skelnet mellem, hvad der virkelig er blevet paavist, og hvad man har sluttet sig til ved sammenlignende Undersøgelser.

Slige Anker hindrer dog ikke, at Bogen maa siges at give meget paalidelige Oplysninger, og den kan derfor paa det bedste anbefales, og det maa haabes, at den vil faa stor Udbredelse. Den er rigt illustreret, og Afbildningerne er gennemgaaende gode og vel valgte. Billedet af Strandarve (Fig. 76) er dog ikke heldigt, og enkelte af Portræterne er ikke saa smukke, som det kunde ønskes. Som Skik er i populære Bøger herhjemme, angives det ikke, hvorfra Billederne stammer, men det forekommer Anm., at dette snarere er en Uskik; maaske vil det dog blive meddelt ved Værkets Afslutning.

L. K. R.

B. L. Robinson and M. L. Fernald: Gray's New Manual of Botany, 7. Ed. New York (American Book Co.) 1908. 928 Sider. $2\frac{1}{2}$ Dollars.

Asa Gray's botaniske Haandbøger har et godt Ry paa sig for Klarhed og Oversigtlighed. Foreliggende Bog er 7de Udgave af en Flora,

som omfatter Blomsterplanterne og Karkryptogamerne i den centrale og nordøstlige Del af de Forenede Stater og den tilgrænsende sydlige og østlige Del af Canada. Denne nye Udgave er bleven betydelig omarbejdet og ændret af Prof. B. L. Robinson og Mr. M. L. Fernald fra Harvard Universitet i Cambridge, Massachusets, hvor Gray's efterladte store Herbarium findes. Begge de to Forff., særlig maaske Robinson, viser i deres botaniske Arbejder en behagelig Overensstemmelse med europæiske Systematikere i Opfattelsen af Artsbegrebet og i Takspørgsmaal vedrørende den botaniske Nomenklatur og staar saaledes paa et os betydeligt nærmere Stade end f. Eks. New Yorker Skolen, hvis iøvrigt fortræffelige, store illustrerede Flora (Britton and Brown: Illustrated Flora of the Northern United States, Canada etc., New York, 1896—98, i 3 Bind) i de senere Aar har været det mest benyttede Værk, naar man vilde vide noget om Nordamerikas Flora. Uden Tvivl vil Robinson's og Fernald's nye Bog, som er anderledes overkommelig, hvad Pris angaar (c. 9 Kr.)¹⁾, mange-steds træde i Stedet for Britton's og Brown's og vil tillige sikkerlig blive anskaffet af Folk, hvem Prisen paa den store Flora har afskrækket, — og den fortjener det ogsaa.

Beskrivelserne synes at være klare og koncise med Fremhævelse ved Kursivering af de vigtigste eller mest iøjnefaldende Karakterer. Over 1000 Smaafigurer i Teksten gengiver Enkeltheder af Planterne; i Slægter eller Familier, hvor Frugterne er vigtige Adskillelsesmærker, er saaledes næsten alle Arters Frugter afbildede; andre Steder er det Blomsterstande eller enkelte Blomster. Selvfølgelig er Nøglesystemet gennemført overalt. Ordningen af Familierne er den samme som i Engler og Prantl's *Natürliche Pflanzenfamilien* (det modificerede Eichler'ske System).

Af Interesse er ogsaa Nomenklaturen i Bogen, idet Forff. fuldt ud har fulgt Wiener Kongressens Bestemmelser og saaledes har vist, at ikke alle nordamerikanske Botanikere mener, at de nordamerikanske Nomenklaturregler er de eneste rette. Naar man ved, i hvor høj Grad Nomenklatur-Divergenser spiller ind i Forstaaelsen af baade den floristisk-systematiske og den økologiske Botanik, og hvor de besværliggør Læsningen af mange botaniske Bøger, maa man hilse enhver Flora, der er bygget med Wiener Kongressens Navne, velkommen og maa haabe, at Forff.'s Ord, at det gælder om at befri den amerikanske botaniske Nomenklatur saa hurtigt som mulig for Særegenhed og Provincialisme, snart maa kunne udstrækkes til at gælde i alle Lande, mutatis, mutandis.

C. H. Ostenfeld.

Katalog over Erhvervelser af nyere udenlandsk Litteratur ved Statens offentlige Biblioteker 1908, udgivet af det Kongelige Bibliotek ved A. A. Bjørnbo. VI. Matematik og Naturvidenskab. København 1909. 63 Sider. Pris 20 Øre.

Det Kongelige Bibliotek udgiver hvert Aar en Fortegnelse over Erhvervelser af nyere udenlandsk Litteratur ved 30 offentlige Biblioteker. Fra i Aar af kan Særtryk af den matematiske og naturvidenskabelige Afdeling faas for den ringe Pris af 20 Øre i det Kgl. Bibliotek, Universitets-

¹⁾ Britton & Brown's Flora kan ikke faas (antikvarisk) under ca. 40 Kr.

biblioteket og Statsbiblioteket i Aarhus, og Botanikens Dyrkere har saaledes let og billig Adgang til at skaffe sig Kundskab om, hvor den nyere udenlandske Literatur, som de har Brug for, findes.

Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz. Zweite Auflage. I. Band. Pilze. VIII. Abt. *Fungi imperfecti: Hyphomycetes* (erste Hälfte), *Mucedinaceae* (*Phaeosporae* und *Phaeodidymae*), bearbeitet von G. Lindau. Leipzig 1907 (1904—1907). VIII + 852 Sider.

Dette Bind, som er det 8de Svampebind i det store Rabenhorst'ske Værk, og det 3die af dem, som omhandler de saakaldte „Fungi imperfecti“, indeholder den første Halvdel af Hyphomyceterne, d. v. s. de konidiebærende Svampe, hvis Konidiebærere er frie, ikke er indesluttede i Beholdere, Pyknider. Der opføres i dette Bind over 1600 Arter, der alle beskrives og indordnes i et System med Bestemmelsesnøgler til Slægterne. Forf. har omhyggelig og kritisk sammenstillet de talrige og overordentlig spredte Beskrivelser i Litteraturen, men han har ogsaa for en stor Del kunnet støtte sig paa egne Undersøgelser. Blandt dem, der har forsynet ham med Materiale, nævner han i Forordet Cand. pharm. J. Lind. Texten er illustreret ved en Mængde Afbildninger i Texten. Forf. opretholder ikke den af Brefeld stærkt hævdede Forskel mellem Konidier og Oidier; det vilde være interessant at vide, om det er fordi han har fundet det umuligt at gøre det. Dette Bind afsluttes med et Slægtsregister, medens et fuldstændigt Artsregister med Synonymer først vil komme ved Afslutningen af det næste Bind. Man maa, ogsaa af Hensyn til dette Register haabe, at dette ikke maa lade længe vente paa sig, thi man savner ofte et saadant Register. Saaledes vil Gæringsteknikere i flere Tilfælde forgæves søge de i deres Praxis forekommende Svampe under de af dem anvendte Navne, idet disse ikke er i Overensstemmelse med Nomenklaturreglerne og derfor i det foreliggende Værk sikkert med Rette er erstattede med andre.

L. R. K.

Jydsk Forening for Naturvidenskab, Aarhus. Meddelelser 1903—1908. Aarhus 1909. 48 Sider.

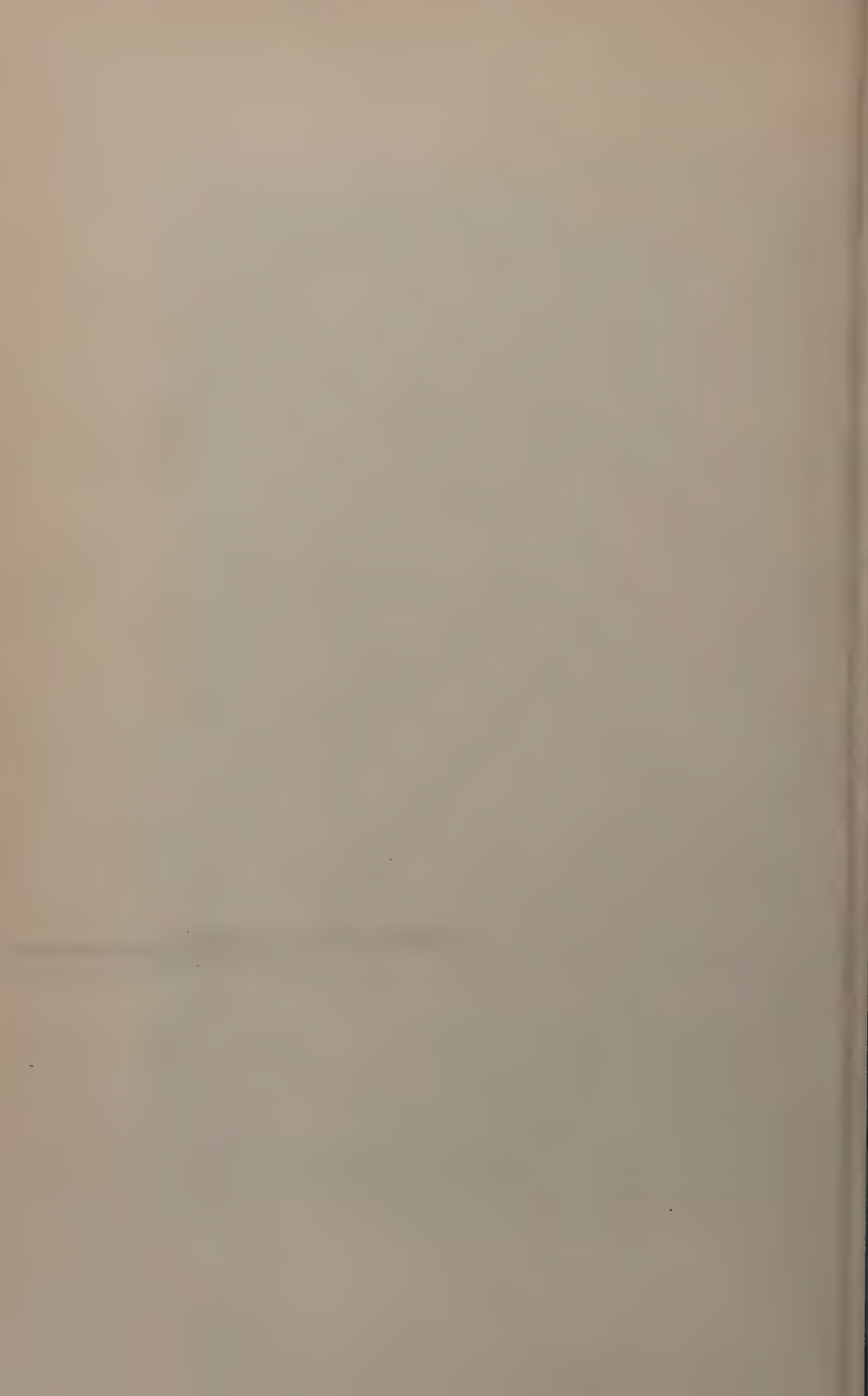
Nærværende Hefte indeholder en Redegørelse for Foreningens Virksomhed fra dens Stiftelse i 1903, for dens Foredrag og Ekspursioner og øvrige Virksomhed, derunder dens Deltagelse i den topografisk-botaniske Undersøgelse. Det oplyses endvidere, at den har dannet et Udvalg for at virke for Oprettelsen af et naturvidenskabeligt Museum i Aarhus, et Maal, som i høj Grad maa interessere Naturvidenskabens Dyrkere her i Landet, men som endnu ikke har ført til et praktisk Resultat. Om den paatænkte Karakter af et saadant Museum indeholder Heftet en Artikel af Havneingeniør P. Vedel. Foruden nogle korte Referater af Foredrag og Beretninger om Ekspursioner findes en Liste over Basidiomycetes i Midtjylland af Lærer Poul Larsen.

Endvidere er tilsendt:

Annales du Musée du Congo. Botanique, Série V. Études de systematique et de géographie botaniques sur la flore du Bas- et du Moyen-Congo par Ém. de Wildeman. Fasc. III. Bruxelles 1908.

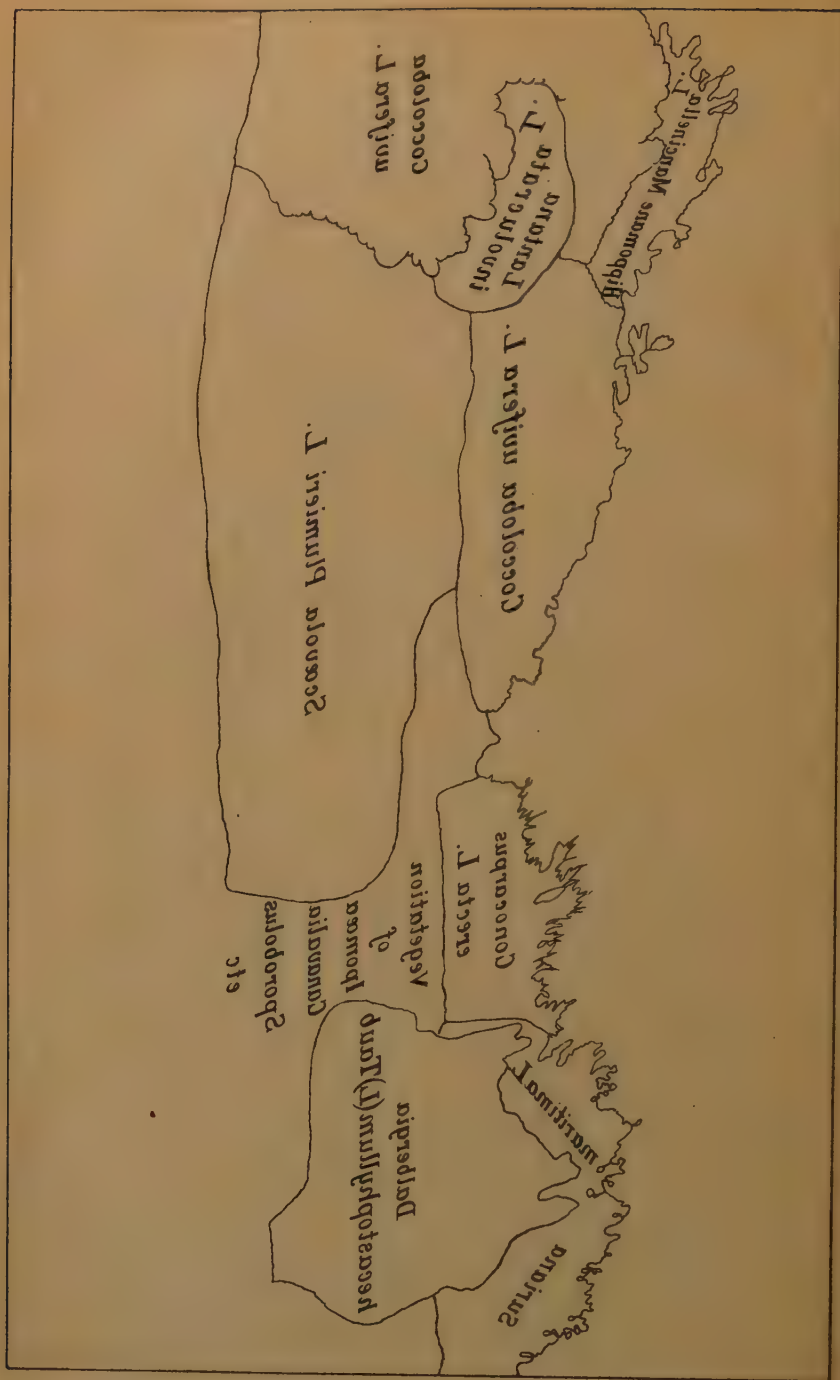


Rhizophora forest at Great Cruz Bay, St. Jan. (F. B. phot.)





Pes capræ formation at Sandy Point, St. Croix. (F. B. phot.)



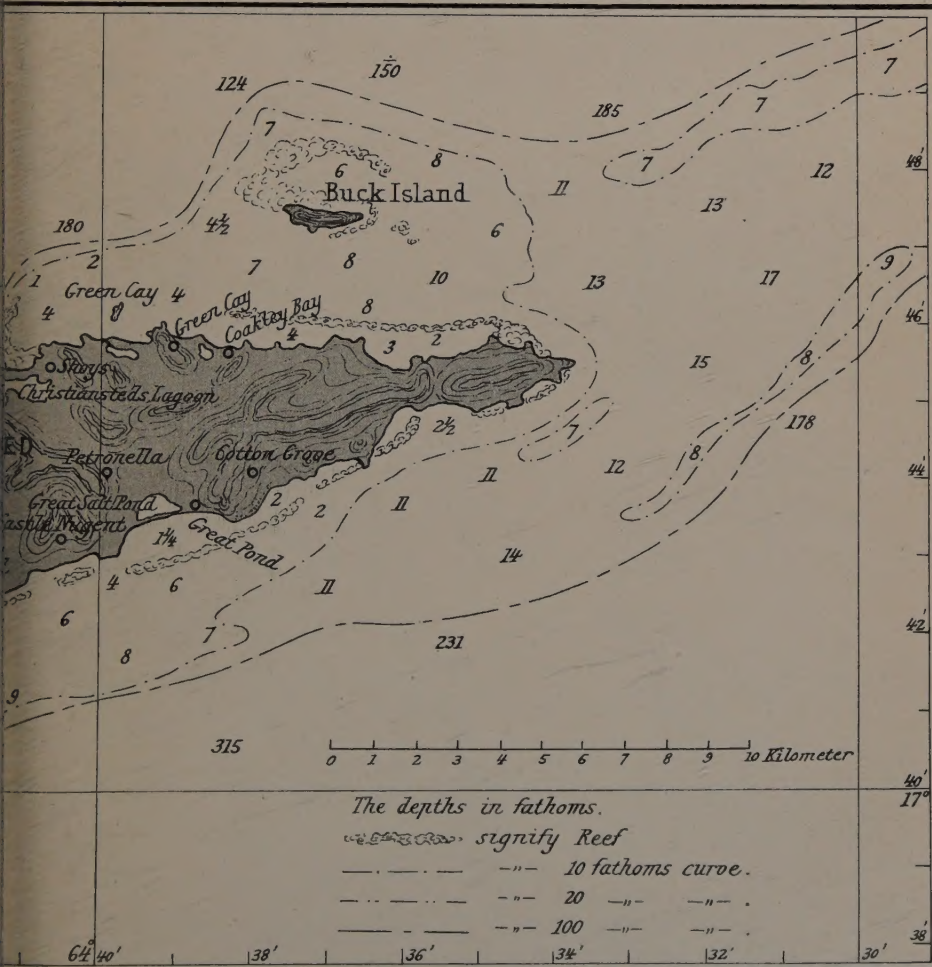
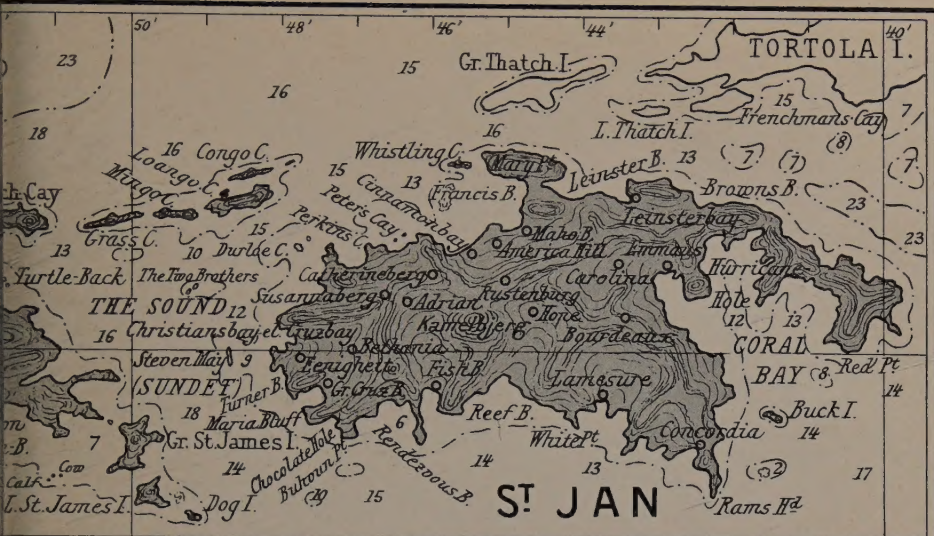


Sand strand vegetation near Krausses Lagoon at the west end of Lime Tree Bay. (F. B. phot.)





MAP OF THE DAN





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Johs. Schmidt: Danmarks blaagrønne Alger I..	2 -	50 -
Indholdsfortegnelse til Botanisk Tidsskrift 1.—25. Bd., Meddelelser 1.—2. Bd. og Festskrift.....	1 -	

¹⁾ Ved Henvendelse til Bestyrelsen.

Mortensen og Ostenfeld: „Alfabetisk Liste over danske Karplanter“ sendes portofrit i Indlandet til Medlemmer og Deltagere i den topografisk-botaniske Undersøgelse mod Indsendelse til Foreningen af 1 Kr., og til Ikke-Medlemmer mod Indsendelse af 1 Kr. 50 Øre.

INDHOLD.

	Side
F. Bergesen: Notes on the Shore Vegetation of the Danish West Indian Islands. (With plate III—VI)	201.
A. Mentz: Studier over danske Hedeplanters Økologi (II. <i>Arctostaphylos</i> -Typen)	260.
Carl Christensen: On <i>Stigmatopteris</i> , a new genus of ferns with a review of its species.	291.
C. Ferdinandsen and Ø. Winge: Mycological Notes II	305.
Mindre Meddelelser:	
Motion au Congrès International de Botanique à Bruxelles 1910	320.
C. H. Ostenfeld: Smaa Bidrag til den danske Flora V	326.
K. Wiinstedt: Optegnelser fra en Ruderatplads	330.
R. Rasmussen: Bemærkninger om Væksten af <i>Bladet</i> hos <i>Alaria esculenta</i> paa Færøerne	333.
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H. Mortensen (ved Eug. Warming)	337.
Ny Litteratur	340.

Dansk botanisk Forening.

Adresse: Botanisk Museum, København K.

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